TENDER SPECIFICATION

BHEL:PSSR:SCT: 1181

FOR

Handling at Site Stores / Storage yard, Transportation to site of Work, Erection, Testing and Commissioning of HT and LT Electrical Package for Units IV & V of 2 x 500 MW set

at

Sipat Thermal Power Project

(for M/s NTPC) , Stage- II ,
Bilaspur District , Chattisgarh State

PART – I TECHNICAL BID

BOOK NO :

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector – Southern Region
690, Anna Salai, Nandanam, Chennai – 600 035.

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BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector, Southern Region
690, Anna Salai, Nandanam, Chennai – 35

Tender Specification No. BHEL:PSSR:SCT: 1181

Messrs Date :

Dear Sir,

SUB: Handling at Site Stores / Storage yard, Transportation to site of Work, Erection, Testing and Commissioning of HT and LT Electrical Package for Units IV & IV of 2 x 500 MW set at Sipat Thermal Power Project, (For M/s NTPC) Stage - II , Bilaspur District, Chattisgarh State..

Please find enclosed one set of non-transferable tender documents containing - **279** - pages along with general conditions of contract Booklet and for the above work.

You are requested to go through the tender documents, GCC Booklet and offer your most competitive rate and submit the tender documents duly filled in as per procedure indicated in the tender specification along with requisite EMD of Rs.2,00,000/- (Rupees Two lakhs only) in the form of Demand Draft drawn in favour of M/s.Bharat Heavy Electrical Limited Chennai - 35. Bids with Deviations from the tender conditions will be rejected.

A SEPARATE LETTER SHALL BE FURNISHED INDICATING THAT THERE ARE NO DEVIATIONS FROM THE TENDER CONDITIONS (As in Page 9.)

The completed quotations shall reach the office of the under signed on or before 12.06.2006 at 15.00 Hrs. The Technical bids, will be opened on the same day at 15.30 hrs. We shall separately intimate the date for opening the price bids only to those parties who are technically qualified. You are requested to depute your authorized representative at the time of opening.

ANY REVISION OF RATES / PRICES WHATSOEVER AFTER THE TIME AND DATE MENTIONED IN TENDER SPECIFICATION FOR SUBMISSION OF COMPLETED QUOTATIONS SHALL NOT BE ENTERTAINED UNLESS CALLED FOR SPECIFICALLY BY BHEL.

Kindly acknowledge the receipt of the tender documents and confirm your participation.

Kindly note that BHEL reserves the right to reject any or all tenders without assigning any reason.

Thanking you,

Yours faithfully,
For and on behalf of
BHARAT HEAVY ELECTRICALS LIMITED

SENIOR DEPUTY GENERAL MANAGER / CONTRACTS

This Tender document is not transferable.

Place : Chennai -35

Encl: One set of Tender documents.

BHARAT HEAVY ELECTRICALS LIMITED
(A government of India undertaking)
Power Sector : Southern Region
690, Anna Salai, Nandanam,
Chennai – 600 035.

SPECIAL INSTRUCTIONS TO BIDDERS

The Bidder must submit their bids as requested in a sealed cover prominently super scribing the Tender Specification number, due date and time of submission as mentioned in the TENDER **NOTICE.**

The following information shall be furnished by the Bidder along with their offer (Technical Bid cover)

01. Details of previous experience during the last five years indicating contract value, duration, completion period and present engagement as per G.C.C.

02. Organization structure of the Company as per GCC.

03. Financial status of the firm enclosing balance sheet and profit and loss account for the past 3 years and certificate from the Company's Banker as per G.C.C

04. Turnover of the Company in last 3 financial years pertaining to this scope of work only.

05. Latest Income Tax clearance certificate.

06. BIO DATA of key personnel presently in the Rolls of the company and proposed site organization for carrying out the work including deployment of Engineers and Supervisors.

07. Declaration sheets as per Appendix of Tender Specification.

08. Checklist and Schedule of General particulars as per Appendix in GCC.

09. T & P owned/deployment details as per G.C.C.

10. Technical manpower deployment details as per G.C.C

11. Other relevant details as per GCC and checklist.

12. These terms and conditions will be read and construed along with General Conditions of contract and incase of any conflict or inconsistency between the General conditions and the Terms and conditions of the tender specification, the provisions contained in the Term and conditions (NIT, Rate Schedule, Common conditions, Special Conditions including Appendices) shall prevail.

13. ***THE BIDDERS ARE REQUESTED TO FURNISH THE DOCUMENTS LIKE COPIES OF LOI'S, WORK ORDER'S ETC PERTAINING TO THE EXPERIENCE INDICATED IN QUALIFYING REQUIREMENTS, AS GIVEN BELOW.***

14. **QUALIFICATION REQUIREMENT**

a) The bidders should possess the experience of having executed successfully the HT / LT Electrical works consisting of Cabling, trays, tray supports, switch gears, control panels, transformers, drives, earthing and other related works in power plant in the last seven years. The bidder should possess valid electrical installation license..

b) The bidders should have a minimum average financial turn over of **Rs.50 Lakhs** per year in the preceding three years ending on 31.03.2005

The bidder must have earned profit in any one of the last three financial years ending on 31.03.2005 and should have positive net worth as on 31.03.2005

Bidder should submit audited balance sheet and profit & loss account of the company for last three years ending on 31.03.2005 in support of above requirement.

c) Notwithstanding the above, BHEL reserves the right to reject any Tender or all the Tenders for the reasons whatsoever beyond our control and the decision of BHEL is final.

LD / Penalty shall be leviable as per the applicable clauses of General Conditions of Contract (GCC)

15. TENDERERS HAVE TO FURNISH A DECLARATION SHEET INDICATING THAT THERE IS NO DEVIATION FROM TENDER DOCUMENTS (AS IN PAGE 8) TENDERERS MAY FURTHER NOTE THAT THIS DECLARATION IS A PREREQUISITE FOR BHEL TO CONSIDER THEIR BIDS. BIDS SUBMITTED WITHOUT "NO DEVIATION DECLARATION" WILL BE REJECTED BY BHEL.

16. SAFETY PLAN

Bidder may further note that the submission of safety plan is a prerequisite for BHEL to consider their bids.

BHARAT HEAVY ELECTRICALS LIMITED
(A government of India undertaking)
Power Sector : Southern Region
690, Anna Salai, Nandanam, Chennai – 600 035.

PROCEDURE FOR SUBMISSION OF SEALED BIDS

The Tenderers must submit their bids as required in two parts in separate sealed covers prominently super scribed 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

Excepting 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.

Tenderers are requested to quote their rates, only in the price bid (part II) provided by BHEL. Quoting of rates in any other form / formats will not be entertained.

These two separate cover I & II (Part I and Part II) shall together be enclosed in a third envelope (Cover III) along with requisite EMD as indicated and this sealed cover shall be super scribed and submitted to Senior Deputy General Manager/Contracts at the above mentioned address before the due date as indicated. The Tenderers will be intimated separately in case any clarifications are required.

NOTE:

Tenderers are issued with 2 Nos. of Technical Bids, 2 Nos. of Price Bids and 2 Nos. of GCC booklet., out of which one set of each document shall be retained by them for their reference. Balance one set shall be submitted along with their offer as per procedure indicated above.

EMD amount for this Tender is Rs.2,00,000/- (Rupees Two Lakhs only). This EMD amount shall be submitted in the form of either pay order or demand draft only drawn in favour of M/s. Bharat Heavy Electricals Limited, Chennai – 35.

EMD amount in the form of Bank Guarantee / fixed deposit receipt or in any other form will not be Accepted.

ANY REVISION OF RATES / PRICES WHATSOEVER AFTER THE TIME AND DATE MENTIONED IN TENDER SPECIFICATION FOR SUBMISSION OF COMPLETED QUOTATIONS SHALL NOT BE ENTERTAINED UNLESS CALLED FOR SPECIFICALLY BY BHEL.

Sr. Deputy General Manager/Contracts.

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector, Southern Region
690, Anna Salai, Nandanam, Chennai – 35

TENDER NOTICE

Sealed Tenders are invited from reputed contractors with sufficient previous experience in the under mentioned similar nature of work:

Tender Specification No. BHEL:PSSR:SCT: 1181

Description	EMD
Handling at Site Stores / Storage yard, Transportation to site of Work, Erection, Testing and Commissioning of HT and LT Electrical Package for Units IV & V of 2 x 500 MW set at Sipat Thermal Power Project, (For M/s NTPC) Stage II Bilaspur District, Chattisgarh State.	**Rs.2,00,000/- (Rupees Two Lakhs only)**

Cost of Tender Documents (Including all Taxes)	:	Rs.1105/-	
Sale Starts on	:	22.05.2006	
Sale closes on	:	09.06.2006	
Due date and Time for Submission	:	12.06.2006	15.00 Hrs.
Date and time for opening Of Technical Bids	:	12.06.2006	15.30 Hrs.

QUALIFICATION REQUIREMENT

a) The bidders should possess the experience of having executed successfully the HT / LT Electrical works consisting of Cabling, trays, tray supports, switch gears, control panels, transformers, drives, earthing and other related works in power plant in the last seven years. The bidder should possess valid electrical installation license..

b) The bidders should have a minimum average financial turn over of **Rs.50 Lakhs** per year in the preceding three years ending on 31.03.2005

The bidder must have earned profit in any one of the last three financial years ending on 31.03.2005 and should have positive net worth as on 31.03.2005

Bidder should submit audited balance sheet and profit & loss account of the company for last three years ending on 31.03.2005 in support of above requirement.

b) Notwithstanding the above, BHEL reserves the right to reject any Tender or all the Tenders for the reasons whatsoever beyond our control and the decision of BHEL is final.

LD / Penalty shall be leviable as per the applicable clauses of General Conditions of Contract (GCC.)

Interested parties can get the Tender documents from the office of the Senior Deputy General Manager / Contracts on all working days by remitting the cost of tender documents either by Cash or A/c Payee Demand Draft drawn in favour of M/s. Bharat Heavy Electricals Limited, Chennai – 600 035. Money order, Cheques and Postal Orders will not be accepted.

The Bharat Heavy Electricals Limited takes no responsibility for any delay, loss or non-receipt of tender documents sent by post and also reserves the right to reject any or all the tender without assigning any reason therefor**. TENDER NOT ACCOMPANIED BY THE PRESCRIBED EARNEST MONEY DEPOSIT ARE LIABLE TO BE SUMMARILY REJECTED.**

SENIOR DEPUTY GENERAL MANAGER/CONTRACTS

TENDER SPECIFICATION : BHEL:PSSR:SCT: 1181

CERTIFICATE FOR NO DEVIATION

I,_____ Of

M/s_____

hereby certify that there is no deviation from the Tender conditions either technical or commercial and I am agreeing to all the terms and conditions mentioned in the Tender Specification.

SIGNATURE OF THE TENDERER

OFFER OF CONTRACTOR

Senior Deputy General Manager/Contracts
Bharat Heavy Electricals Limited,
Power Sector : Southern Region
690, Anna Salai,
Nandanam,
Chennai – 600 035.

Sir,

I/We hereby offer to carry out the work detailed in Tender Specification No.BHEL:PSSR:SCT:1181 issued by Bharat Heavy Electricals Limited, Power Sector : Southern Region, 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 Tenderer
2. General Conditions of Contract
3. Special conditions of Contract
4. Other Section, Appendices and Schedules

I/We have deposited/forwarded herewith the Earnest Money Deposit/a sum of Rs.2,00,000/- (Rupees Two Lakhs only) vide DD.No. . Dt. which shall be refunded should our offer not be accepted. Should our offer be accepted, I/We further agree to deposit such additional sum which along with the sum of Rs.2,00,000/- (Rupees Two Lakhs only) mentioned above, to make up the Security Deposit for the work as provided for in the Tender Specification within the stipulated time as may be indicated by BHEL, Power Sector : Southern Region, Chennai – 600 035.

I/We further agree to execute all the works referred to in the said documents upon the terms and conditions obtained or referred to therein and as detailed in the appendices annexed thereto.

DATE: CONTRACTOR:

PLACE: ADDRESS:

Witness with their address

Signature Name Address

PROJECT INFORMATION

2 x 500 MW SIPAT – STAGE – II

1. Owner : National Thermal Power Corporation

2. Project Title : Unit 2 x 500 MW Sipat TPP Stage - II

3. Location :

- Project is located East of Kurung Left Bank Cannel near Rank, Kaudia, and Janji in the Bilaspur Dist. (Chattisgarh)
- Latitude 22 Deg.05' & 22 Deg 09' North and longitude 82 Deg 16' & 82 Deg 18' East.
- Approximately 20 KMs from Bilaspur City Via Bilaspur – Sipat State highway
- Nearest Railway Station is Jairamnagar on Nagpur – Raipur – Howrah BG line about 15 KM from site.
- Nearest Commercial Airport is Raipur – 140 Km from Site
- Nearest Major Town – Bilaspur at 20 KM from site.
- Nearest state Highway – 1 KM from site.

General Conditions of Contract for Works in Power Sector of Bharat Heavy Electricals Limited For Mechanical, Electrical & Enabling works

SECTION I

1. GENERAL INSTRUCTIONS TO TENDERERS :

1.1 DESPATCH INSTRUCTIONS :

1.1.1 This tender specification as a whole, duly furnishing all the details required and other documents as required in the following pages, shall be duly signed and sent in sealed cover duly super scribing the name of work as given in the tender notice.

1.1.2 The tender shall be addressed to : Officer inviting tender as indicated in the tender notice.

1.1.3 Tenders submitted by post shall be sent as "REGISTERED POST ACKNOWELEDGEMENT DUE" or by any mode and shall be posted with due allowance for any postal delay. The tenders received after the due date and time of opening are liable to be rejected. Telegraphic offers and offers received by telex, fax, electronic mail will not be considered.

1.1.4 Tenders shall be opened by authorized official of BHEL at his office at the time and date as specified in the tender notice in the presence of those tenderers or their authorized representatives who may be present.

1.1.5 The tenderers shall closely peruse all the clauses, specifications and drawings indicated in the Tender Documents before quoting. Should the tenderer have any doubt about the meaning of any portion of the Tender Specifications or find discrepancies or omission in the drawings or the tender documents issued are incomplete or shall require clarification on any of the technical aspect, scope of work etc., he shall at once contact the authority inviting the tender for clarification before the submission of the tender.

1.1.6 Before tendering, the tenderers are advised to inspect the site of work and the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, position of material and labour. No claim will be entertained later on the ground of lack of knowledge. The tenderer should fill up and sign the form provided in the document without fail. The offer is liable for rejection by BHEL if the contractor is not fulfilling this requirement.

1.1.7 **TENDERER MUST FILL UP ALL THE SCHEDULES AND FURNISH ALL THE REQUIRED INFORMATION AS PER THE INSTRUCTIONS GIVEN IN VARIOUS SECTIONS OF THE TENDER SPECIFICATION. EACH AND EVERY PAGE OF THE TENDER SPECIFICATION MUST BE SIGNED, STAMPED AND SUBMITTED ALONG WITH THE OFFERS BY THE TENDERER IN TOKEN OF COMPLETE ACCEPTANCE THEREOF. THE INFORMATION FURNISHED SHALL BE COMPLETE BY ITSELF.**

1.1.8 The tenderer shall quote the rates in English Language and international numerals. These rates shall be entered in figures as well as in words. In case of difference in rates between words and figures, the least of the two will be treated as valid rate. For the purpose of the tender, the metric system of units shall be used.

1.1.9 All entries in the tender shall either be typed or to be written in ink, including ball point pens. Erasers and over writings are not permitted and may render such tenders be liable to summary rejection. All cancellations and insertions shall be duly attested by the tenderer, without fail.

1.2 **QUALIFICATION OF TENDERERS :**

Only tenderers who have previous experience in the work of this nature and description detailed in this tender specification are expected to quote for this work duly detailing their experience along with the offer. Offers from tenderers who do not have proven and established experience in the field are not likely to be considered. The tenderers are requested to refer to the Special Conditions of Contract for any specific requirement and the qualification requirement mentioned, if any.

1.3 **DATA TO BE ENCLOSED :**

Full information/documents shall be given by the tenderer in respect of the following. Non submission of these information may lead to rejection of the offer.

1.3.1 **FINANCIAL STATUS :**

A certificate from Scheduled Bank to prove his financial capacity to undertake the work duly indicating financial limits the tenderer enjoys or Solvency Certificate from the concerned Government authority. Information required in Section IV shall be furnished by the tenderer along with the offer.

1.3.2. **INCOME – TAX CERTIFICATES :**

A Certificate of Income –Tax clearance from the appropriate authority in the forms prescribed therefor duly indicating annual turnover. These certificates shall be valid for one year from the date of issue or for the period prescribed therein for all tenders submitted during that period.

1.3.3 **PREVIOUS EXPERIENCE :**

A statement giving particulars duly supported by documentary evidence of the various services rendered for each similar works by the tenderer indicating the particulars and value of each work, the site location, duration and date of completion. A list of site location, particulars and value of various services that are under progress. Information required in Section V shall be furnished by the tenderers along with the offer.

1.3.4 **ORGANISATION CHART :**

The organization pattern that is totally available with him and that will be employed by the tenderer for this work duly indicating the number of executives, the number of supervisors, the number of skilled and unskilled persons etc. as per the enclosed format to be furnished (Section IV & V)

1.3.5 An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor, shall also be attached.

1.3.6 **IN CASE OF AN INDIVIDUAL :**

His full name, address and place and nature of business.

1.3.7 **IN CASE OF PARTNERSHIP FIRMS:**

The name of the partners and their addresses. A copy of the partnership deed/instrument of partnership certified by Notary Public shall be enclosed.

1.3.8 **IN CASE OF COMPANIES:**

Copy of Certificate of Registration giving date and place of registration including date of commencement. In case of public companies certified copies of Memorandum and Articles of Association are to be furnished.

1.3.9 Nature of business carried on by the Company and the provisions of the Memorandum relating thereof.

1.3.10 Names and particulars including addresses of all the Directors and their previous experience.

1.3.11 A list of tools and tackles that the tenderer is having and those that will be used on this job.

1.3.12 In addition to the above, the particulars required in various annexures /appendices.

1.4.0 **EARNEST MONEY DEPOSIT :**

Every tender must be accompanied by the prescribed amount of Earnest Money Deposit in the following forms .

1.4.1 Pay Order or Demand Draft duly drawn in favour of Bharat Heavy Electricals Limited.

1.4.2 Cash, to the extent permitted under Income-Tax Act.

Note:

1) Cheques, Currency Notes enclosed in covers, Money Orders or Postal Orders will not be accepted.
2) Bank Guarantee will not be accepted.

1.4.3 Tenders received without Earnest Money in full in the manner prescribed above are liable to be rejected.

1.4.4 The Earnest Money Deposit of the successful tenderer paid in the form of DD/pay order will be retained towards cash portion of Security Deposit.

1.4.5 In the case of unsuccessful tenderers, the Earnest Money will be refunded to them within a reasonable time after finalisation of the tender

1.4.6 Earnest Money pertaining to the successful tenderer will be forfeited if the tenderer.

1. Fails to start the work as indicated in the Letter of Intent. In case the LOI is silent in this regard, then within 15 days after award of contract.
2. After opening of Tender, revokes/ withdraws his tender within the validity period, revises/alters his earlier quoted rates/conditions.

1.5 AUTHORISATION AND ATTESTATION:

1.5.1 Tenders shall be signed by persons duly authorized /employed to do so. Certified copies of such authority and relevant documents are to be enclosed.

1.6 VALIDITY OF OFFER:

The rates in the Tender shall be kept open for acceptance for a minimum period of six months from the date of opening of tenders. In case Bharat Heavy Electricals Limited, calls for negotiation, such negotiation shall not amount to cancellation or withdrawal of the original offer which shall be binding on the tenderers.

1.7 EXECUTION OF CONTRACT:

The successful tenderer's responsibility under this contract commences from the date of issue of the Letter of Intent by Bharat Heavy Electricals Limited. The tenderer shall submit an unqualified acceptance to the letter of Intent within the period stipulated therein. The text of acceptance of Letter of Intent should read as follows:

"We hereby acknowledge receipt of your Letter of Intent No……dated…….. and we convey our unqualified acceptance for the same.

The successful tenderer shall be required to execute an agreement in the prescribed form (Annexure 'D') with BHEL within a reasonable time after the acceptance of his tender and in any case before submitting the first bill for payment. The expenses for completion and stamping and registration of the agreement with prescribed authority, if necessary shall be borne by the contractor.

1.8 **SECURITY DEPOSIT:**

1.8.1 Upon acceptance of tender, the successful tenderer within the time specified in the Letter of Intent must deposit the required amount of Security Deposit for satisfactory completion of work.

1.8.2 The total amount of Security Deposit shall be as follows:

1.8.2.1 Upto Rs.10 lakhs 10 %

1.8.2.2 Above Rs.10 lakhs)
Upto Rs.50 lakhs) 1 lakh + 7.5% of the amount exceeding Rs.10 lakhs

1.8.2.3 Above Rs. 50 lakhs Rs 4. lakhs + 5% of the amount exceeding Rs.50 lakhs

1.8.3 The Security Deposit should be deposited before start of work. 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 realisation.
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).

1.8.3.1 50% of Security Deposit as indicated in the letter of Intent can either be remitted in cash to the cashier of Power Sector of BHEL or submitted in the form of Bank Guarantee in the prescribed Performa, the validity being up to completion of work as stipulated in Letter of Intent and the balance deposit can be remitted in cash or can be recovered by deduction from running bills at 10% of the value of each running bill till the full Security Deposit is made up. The bank Guarantee furnished towards Security Deposit should be kept valid by proper renewal till the said work is actually completed.

1.8.4 If the value of the work done at any time exceeds the accepted agreement value, the Security Deposit shall be correspondingly enhanced and the extra Security Deposit shall be immediately deposited by the Contractor or recovered from payments due to him.

1.8.5 Regarding adjustment of Earnest Money Deposit towards part of Security Deposit, refer clause 1.4.4 above.

1.8.6 Failure to deposit the Security Deposit within the stipulated time, may lead to forfeiture of Earnest Money and Cancellation of the award of work.

1.8.7 If any part of Security Deposit of the Contractor is held in the form of approved securities, it shall be kept transferred in the name of Bharat Heavy Electricals Limited, Power Sector, in such a manner that the same can be realised fully without referring to the Contractor. BHEL shall not be responsible for any depreciation in the value of the Security while in BHEL's custody or for any loss of interest thereon.

1.8.8 BHEL reserves the right of forfeiture of Security Deposit in addition to the other claims and penalties in the event of the Contractor's failure to fulfill any of the contractual obligations or in the event of termination of contract as per terms and conditions of contract. BHEL reserves the right to set off the Security Deposit against any claims of any other contracts with BHEL.

1.8.9 **RETURN OF SECURITY DEPOSIT:**

If the contractor fully performs and completes the work in all respects to the entire satisfaction of BHEL and present an absolute " No Demand Certificate" in the prescribed form and returns properties belonging to BHEL handed over, lent or hired by him for carrying out the said works, Security Deposit will be released to the contractor after deducting all cost of expenses or other amounts that are to be paid to BHEL under this or other contracts entered into with the contractor. **It may be noted that in no case the Security Deposit shall be refunded / released prior to passing of final bill.**

1.9 **REJECTION OF TENDER AND OTHER CONDITIONS:**

1.9.1 The acceptance of tender will rest with BHEL which does not bind itself to accept the lowest tender or any tender and reserves to itself full rights for the following without assigning any reasons whatsoever.

1.9.1.1. To reject any or all of the tenders.

1.9.1.2 To split up the work (Please refer NIT and Special Conditions of Contract).

1.9.1.3 Either of the contingencies stated (1.9.1.1) and (1.9.1.2) above to modify the time for completion suitably.

1.9.2 Conditional tenders, tenders containing absurd or unworkable rates and amounts and tenders which are incomplete and otherwise considered defective and tenders not in accordance with the tender conditions, specifications etc, are liable to be rejected.

1.9.3 If a tenderer expires after the submission of his tender or after the acceptance of his tender, BHEL may at their discretion, cancel such tender. If a partner of a firm expires after the submission of the tender or after the acceptance of the tender, BHEL may cancel such tender at their discretion unless the firm retains its character.

1.9.4 BHEL will not be bound by any Power of Attorney granted by the tenderer or by changes in the composition of the firm made subsequent to the execution of the contract. They may, however, recognize such Power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.

1.9.5 If tenderer deliberately gives wrong information in his tender, BHEL reserves the right to reject such tender at any stage or to cancel the contract, if awarded and forfeit the Earnest Money/Security deposit, any other money due.

1.9.6 If the tenderers resort to canvassing in any form in connection with the tenders submitted by them, such tenders are liable to rejection.

1.9.7 Should a tenderer or Contractor or in the case of a firm of Company of contractors/ one or more of its partners/Shareholders/ Directors have a relation or relations employed in BHEL, the authority inviting tender shall be informed of the fact along with the offer, failing this BHEL, may, at its sole discretion reject the tender or cancel the contract and forfeit the Earnest Money/Security Deposit.

1.9.8 The successful tenderer should not sub-contract part or complete work detailed in the tender specification undertaken by him without prior written permission of BHEL. The tenderer is solely responsible to BHEL for the work awarded to him.

1.9.9 No interest shall be payable by BHEL on Earnest Money, Security Deposit/ or on any money due to the Contractor by BHEL.

General Conditions of Contract
SECTION II

2.1 **DEFINITION:**

The following terms shall have the meaning hereby assigned to them except where the context otherwise required.

2.1.1 BHEL (or B.H.E Ltd) shall mean Bharat Heavy Electricals Limited, a company registered under Indian companies Act 1956, with its Registered Office at BHEL House, Siri Fort, New Delhi –110 049, or its Authorised Officers or its Resident Engineer or other employees authorised to deal with any matters with which these persons are concerned on its behalf.

2.1.2 **"GENERAL MANAGER"** shall mean the Officer in Administrative charge of contracting unit of BHEL.

2.1.3 **"ENGINEER"** or **"ENGINEER IN CHARGE"** shall mean engineer deputed by BHEL. The term includes "DGM", "PROJECT MANAGER", "RESIDENT MANAGER", "SITE ENGINEER", "RESIDENT ENGINEER" and "ASSISTANT SITE ENGINEER" of BHEL at the site as well as the Officers in charge at Head Office.

2.1.4 **"SITE"** shall mean the place or places at which the plants/ equipment are to be erected and services are to be performed as per the specification of this contract.

2.1.5 **" CLIENT OF BHEL"** or **" CUSTOMER"** shall mean the project authorities to whom BHEL is supplying the equipments/services.

2.1.6. **"CONTRACTOR"** shall mean the individual, firm or company who enters into contract with BHEL and shall include their executors, administrators, successors and permitted assignees.

2.1.7 **"CONTRACT"** or **"CONTRACT DOCUMENT"** shall mean/and include the agreement or work order, the accepted appendices of rates, Schedule of Quantities, if any and General Conditions of Contract, the Special Conditions of Contract, instructions to the tenderers, the drawings, the technical specifications, the special specifications, if any, the tender documents and the letter of Intent/Accepting letter issued by BHEL. Any conditions or terms stipulated by the contractor in the tender documents or subsequent letters shall not form part of the contract unless, specially accepted in writing by BHEL, in the Letter of Intent and incorporated in the agreement.

2.1.8 **"GENERAL AND SPECIAL CONDITIONS OF CONTRACT"** shall mean the "Instructions to Tenderers and General and Special conditions of contract pertaining to the work, for which the tenders are called for"

2.1.9 **"TENDER SPECIFICATION"** shall mean the specific conditions, Technical specifications, appendices, site information and drawing" pertaining to the work in which the tenderers are required to submit their offer. Individual specification number will be assigned to each tender specification.

2.1.10. **"TENDER DOCUMENTS"** shall mean the General and Special Conditions of Contract (2.1.8) and tender specification (2.1.9)

2.1.11. **"LETTER OF INTENT"** shall mean the intimation by a letter to the tenderer that the tender has been accepted in accordance with provisions contained in that letter. The responsibility of the contractor commences from the date of this letter and all the terms and conditions of contract are applicable from this date.

2.1.12. **"COMPLETION TIME"** shall mean the period by date specified in the acceptance of tender or date mutually agreed upon for handing over of the erected equipment/plant which are found acceptable by the Engineer being of required standard and confirming to the specifications of the contract.

2.1.13 **"PLANT"** shall mean and connote the assembly of the plant and equipment covered by the contract.

2.1.14 **"EQUIPMENT"** shall mean all equipments, machineries, materials, structurals, electricals and other components of the plant covered by the contract

2.1.15 **"TESTS"** shall mean and include such test or tests to be carried out on the part of the contractor as are prescribed in the contract or considered necessary by BHEL, in order to ascertain the quality, workmanship, performance and efficiency of the contract work or part thereof.

2.1.16 **"APPROVED" "DIRECTED"** or **" INSTRUCTED"** shall mean approved, directed or instructed by BHEL.

2.1.17 **"WORK OR CONTRACT WORK"** shall mean and include supply of all categories of labours, specified consumables, tools and tackles required for complete and satisfactory site transportation, handling, stacking, storing, erecting, testing and commissioning of the equipment to the entire satisfaction of BHEL.

2.1.18 **"SINGULAR AND PLURAL ETC"** Words carrying singular number shall also include plural and vice versa, where the context be required. Words imparting the masculine gender shall be taken to include the feminine

gender and words imparting persons shall include any company or association or body of individuals, whether incorporated or not.

2.1.19 **"HEADING"** The headings in these general conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken into consideration in the interpretation or construction thereof or of the contract.

2.1.20 **"MONTH:** shall mean calendar month, unless specified otherwise in the tender.

2.1.21 **"WRITING"** shall include any manuscript typewritten or printed statement under the signature of BHEL.

2.1.22. '**TEMPORARY WORK'** shall mean all temporary works of every kind required in or for the execution, completion or maintenance of the works.

2.2 LAW GOVERNING THE CONTRACT AND COURT JURISDICTION:

The Contract shall be governed by the Law for the time being in force in the Republic of India. The Civil Court having ordinary original Civil Jurisdiction at Madras, Tamilnadu shall alone have exclusive jurisdiction in regard to all claims in respect of this contract. No other Civil Court have jurisdiction in case of any dispute, under this contract.

2.3 ISSUE OF NOTICE:

The contractor shall furnish to the BHEL Engineer, the name, designation and address of his authorised agent and all complaints, notices, communications and reference shall be deemed to have been duly given to the Contractor if delivered to the Contractor or his authorised agent or left at or posted to the address either of the contractor or of his representative and shall be deemed to have been so given in the case of posting on the day on which they would have reached such address in the ordinary course of post or on which they were so delivered of /or left.

2.4 USE OF LAND

No land belonging to BHEL or their customer under temporary possession of BHEL shall be occupied by the Contractor without the written permission of BHEL.

2.5 COMMENCEMENT OF WORK

2.5.1 The contractor shall commence the work within the time indicated in the Letter of Intent from BHEL and shall proceed with the same with due expedition without delay.

2.5.2 If the successful tenderer fails to start the work within the stipulated time, BHEL at its sole discretion will have the right to cancel the contract. His Earnest Money and/or security deposited with BHEL will stand forfeited without any further reference to him without prejudice to any and all of BHEL's other rights and remedies in this regard.

2.5.3 All the works shall be carried out under the direction and to the satisfaction of BHEL

2.5.4 The transported equipment erected/constructed plant or work performed under the Contract as the case may be shall be taken over when it has been completed in all respects and/or satisfactorily put into operation at site.

2.6 MODE OF PAYMENT AND MEASUREMENT OF THE WORK COMPLETED

2.6.1 All payment due to the contractor shall be paid by "Account Payee Cheques"

2.6.2 For progress running bill payment, the contractor shall present detailed measurement sheets, in triplicate, duly indicating all relevant details based on technical documents and connected drawings for work done during the month/period under various categories in line with terms of payment as per Letter of Intent. The basis of arriving at the quantities/ weights shall be relevant to documents and drawings released by BHEL. These measurement sheets shall be prepared jointly with BHEL Engineers and signed by both the parties.

2.6.3 These measurement sheets will be checked by BHEL Engineers and quantities and percentage eligible for payment under various groups shall be decided by BHEL Engineers. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in measurement books and signed by both the parties.

2.6.4 Based on the above quantity, contractor shall prepare the bills in prescribed proforma and work out the financial value. These will be entered in M book and signed by both the parties and paid for after duly effecting recoveries due.

2.6.5 All recoveries due from the contractor for the month/period shall be effected in full from his corresponding running bills unless specific approval from the competent authorities is obtained otherwise.

2.6.6 Measurement shall be restricted to that for which it is required to ascertain the financial liability of BHEL under this contract.

2.6.7 The measurement shall be taken jointly by persons duly authorised on the part of BHEL and by the contractor.

2.6.8 The contractor shall bear the expenditure involved, if any, in making the measurement. The contractor shall without extra charges, provide all the assistance with appliances and other things necessary for measurement.

2.6.9 If at any time due to any reason whatsoever, it becomes necessary to remeasure the work done in full or in part, the expenses towards such measurements shall be borne by the contractors.

2.6.10 Passing of measurement as per bills does not amount to acceptance of the completion of the work mentioned. Any left out work has to be completed by the contractor if pointed out at a later date by BHEL.

2.6.11 Final measurement bill shall be prepared in the final bill proforma prescribed for the purpose based on the certificate issued by BHEL Engineer that entire work as stipulated in the tender specification has been completed in all respects to the entire satisfaction of BHEL. Contractor shall give unqualified "No Due" and "No Demand" certificates. All the tools and tackles loaned to him should be returned in good condition, satisfactory to BHEL. Quantities/Weight erected shall be prepared and paid , within a reasonable time after completion of work. After payment of final bill, only guarantee obligation percentage shall remain unpaid which shall be released in accordance with clause 2.13. The final bill quantities and financial value shall also be entered in Measurement Book and signed by both the parties to the contract.

2.7 RIGHTS OF BHEL

BHEL reserves the following rights in respect of this contract without entitling the contractor for any compensation

2.7.1 To get the work done through other agency at the risk and cost of the contractor in the event of Contractor's poor progress or inability to progress the work for completion as stipulated in the contract, poor quality of the work, persistent disregard to instruction of BHEL ,assignment transfer, subletting of the contract without permission of BHEL, nonfulfillment of any contractual obligation etc, and to claim, recover compensation for such losses from the contractor including BHEL's supervision charges and overheads from Security Deposit/ other dues.

2.7.2 To withdraw any portion of work and or to restrict/alter quantum of work as indicated in the contract during the progress of erection and get it done through other agency and / or by departmental labour to suit BHEL's commitment to its customer or in case decided to advance the date of completion due to other emergency reasons / BHEL's obligation to its customer.

2.7.3 To terminate the Contract after due notice of 21 days from the date of issue of the letter, recover the loss sustained in getting the balance work done through other agencies in addition to liquidated damages in the event of.

2.7.3.1 Contractor's continued poor progress.

2.7.3.2 Withdrawal from or abandonment of the work before completion of the work.

2.7.3.3 Corrupt act of Contractor.

2.7.3.4 Insolvency of the Contractor.

2.7.3.5 Persistent disregard to the instructions of BHEL.

2.7.3.6 Assignment transfer, subletting of the contract without BHEL's permission.

2.7.3.7 Non-fulfilment of any contractual obligations.

2.7.4 To recover any money due from the contractor from any money due to the contractor under this contract or any other contract or from the Security Deposit.

2.7.5 To claim compensation for the total losses including BHEL's supervision charges, overheads, penalty/LD suffered by BHEL for completion of works, whenever the contract has to be terminated for the reasons attributable to the contractor.

If the works are delayed beyond the stipulated time for the reasons attributable to the contractor, LD/Penalty will be levied at the rate of 0.5 percent per week of delay or part thereof, subject to a ceiling of 10 percent of the contract value.

2.7.6 To terminate the Contract or to restrict the quantum of work and pay for portion of work executed, in case BHEL's contract with their customers are terminated for any reason.

2.7.7 To effect recovery from any amounts due to the contractor under this or any other contract or in any other form the moneys BHEL is forced to pay to anybody, due to contractor's failure to fulfil any of his obligations.

2.7.8 To restrict or increase the quantity and nature of work to suit site requirement since the tender specification is based on preliminary documents and quantities furnished therein are indicative and approximate and the rates quoted shall not be subject to revision.

2.7.9 To deploy BHEL's fitters, welders, operators and technicians in case of emergency / poor progress/deficiency in skill on the part of employees of contractor and to recover the expenditure on account of the same from contractor's bills.

2.7.10 While every endeavour will be made by BHEL, they cannot guarantee un-interrupted work due to conditions beyond their control. Contractor will not be entitled for any compensation or extra payment on this account.

2.7.11 In the event of any dispute of any nature, the decision of BHEL shall be final and binding on the contractor.

2.8 RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OF LOCAL LAWS, EMPLOYMENT OF WORKERS ETC.

The following are the responsibilities of the contractor in respect of observation of local laws, employment of personnel, payment of taxes etc.

2.8.1 As far as possible, unskilled worker shall be engaged from the local areas in which the work is being executed.

2.8.2 The contractor at all times during the continuance of this contract shall, in all his dealings with local labour for the time being employed on or in connection with the work, have due regard to all local festivals and religions and other customs.

2.8.3 The contractor shall comply with all State and Central Laws, Statutory Rules, Regulation etc., such as : The payment of Wages Act, Minimum Wages Act, Workmen Compensation Act, Employer's Liability Act, Industrial Disputes Act, Employees' Provident Fund Scheme, Employees' State Insurance Scheme, Contract Labour (Regulations and Abolition) Act, 1970 and other Acts, Rules & Regulations for labour as may be enacted by the Government during the tenure of the contract and having in force or jurisdiction at site. The Contractor shall give to the local governing body, Police and other relevant authorities all such notices as may be required by law. (Salient Provisions of the Contract Labour (Regulation & Abolition) Act 1970, Workmen Compensation Act 1923, Employees' State Insurance Act 1948, Minimum Wages Act 1948, Employees' Provident Fund and Miscellaneous Act 1952, which are reproduced in Section-III. However the contractor should take care of the latest amendments into consideration)

2.8.4 The Contractor shall pay all taxes , fees, licence, charges, deposits, duties, tools, royalty, commissions or other charges, which may be leviable on account of any 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 the contractor either from his bills or otherwise as deemed fit.

2.8.5 While BHEL would pay the inspection fees of the Boiler Inspectorate, all other arrangements for the visits periodically by Boiler Inspector to site Inspection Certificates etc., will have to be made by the Contractor. However, BHEL will not make any payment to Boiler Inspector in connection with contractor's welders' qualification/requalification tests etc.

2.8.6 The contractor shall be responsible for provision of health and sanitary arrangements more particularly described in Contract Labour (Regulations & Abolition) Act, safety precautions etc., as may be required for safe and satisfactory execution of the contract. Please refer Clause 2.15.0 also.

2.8.7 The Contractor shall be responsible for proper accommodation including adequate medical facilities for the personnel employed by him.

2.8.8 The contractor shall be responsible for proper behavior and observance of all regulations by the staff employed by him.

2.8.9 The contractor shall ensure that no damage is caused to any person/property of other parties working at site. If any such damage is caused, it is the responsibility of the contractor to make good the losses or compensate for the same.

2.8.10 All the properties/equipment/components of BHEL/ their client loaned with or without deposit to the contractor in connection with the contract shall remain the properties of BHEL /their client.

The contractor shall use such properties for the purpose of execution of this contract. All such properties/equipment/components shall be deemed to be in good conditions when received by the Contractor unless he notifies within 48 hours to the contrary. The contractor shall return them in good condition as and when required by BHEL/ their client. In case of non-return, loss, damage, repairs etc., the cost thereof, as may be fixed by the Site Engineer will be recovered from the contractor.

2.8.11 It is not obligatory on the part of BHEL to supply any tools and tackles or other materials other than those specifically agreed to do so by BHEL. However depending upon the availability/possibility BHEL's / customer's handling equipment and other plants may be made available to the Contractor on payment of the hire charges/free of charges, as fixed subject to the conditions laid down by BHEL/Customer from time to time. Unless paid in advance such hire charges if applicable, shall be recovered from contractor's bills / Security Deposit in one installment.

2.8.12 The contractor shall fully indemnify BHEL against all claims of whatsoever nature arising during the course of erection/construction/performing work under the contract.

2.8.13 In case the Contractor is required to undertake any work outside the scope of this contract, the rates payable shall be those mutually agreed upon.

2.8.14 Any delay in completion of works/or non achievement of periodical targets, due to reasons attributable to the contractor, the same will have to be compensated by the contractor either by increasing manpower and resources or by working extra hours and/or by working more than a shift. All these are to be carried out by the contractor at no extra cost.

2.8.15 The contractor shall arrange and co-ordinate his work in such a manner as to cause no hindrance to other agencies working in the same premises.

2.8.16 All safety rules and codes applied by the client/BHEL at site shall be observed by the contractor without exception. The Contractor shall be responsible for the safety of the equipment/ material and works to be performed by him and shall maintain all lights, fencing guards, signs etc, or other protection necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer with a view to prevent pilferage, accidents fire hazards and due precautions shall be taken against fire hazards and Atmospheric conditions. Suitable number of clerical staff, watch and ward, store keepers to take care of equipment materials and construction tools and tackle shall be posted at site by the contractor till the completion of the work under this contract.

The Contractor shall arrange for such safety devices as are necessary for such type of work and carry out the requisite site tests of handling equipment, lifting tools, tackles, etc., as per prescribed standards and practices.

2.8.17 The contractor will be directly responsible for payment of wages to his workmen. A pay roll sheet giving all the payments given to the workers and duly signed by the contractor's representative should be furnished to BHEL site office for record purpose, if so called for.

2.8.18 In case of any class of work for which there is no such specification as laid down in the contract, such work shall be carried out in accordance with the instructions and requirements of the Engineer.

2.8.19 No levy or payment or charge made or imposed shall be impeached by reason of any clerical error or by reason of any mistake in the amount levied or demanded or charged.

2.8.20 Also no idle labour charges will be admissible in the event of any stoppage caused in the work resulting in contractor's labour being rendered idle due to any cause at any time.

2.8.21 The contractor shall take all reasonable care to protect the materials and work till such time the Plant/equipment has been taken over by BHEL / their client.

2.8.22 Contractor shall not stop the work or abandon the site for whatsoever reason or dispute, excepting for force majeure conditions. All such problems /dispute shall be separately discussed and settled without affecting the progress of work. Such stoppage or abandonment shall be treated as breach of contract and dealt with accordingly.

2.8.23 Contractor shall keep the area of work clean and shall remove the debris etc. while executing the work every day. Upon completion of work, the contractor shall remove from the vicinity of work, all scrap, packing materials, rubbish, unused and other materials and deposit them in places specified by the Engineer. The contractor will also demolish all the hutments, sheds, offices, etc. constructed and used by him and shall clean the debris. In the event of his failure to do so, the same will be arranged to be done by the Engineer and the expenses recovered from the contractor**.**

2.8.24 The contractor shall execute the work in the most substantial and workman-like manner in the stipulated time. Accuracy of work and timely execution shall be the essence of this contract. The contractor shall be responsible to ensure that the quality, assembly and workmanship conform to the dimensions and clearance given in the drawings and/or as per the instructions of the Engineer.

2.8.25 The contractor shall furnish daily labour deployment report indicating the classification and number of workmen engaged. Besides the contractor also shall furnish progress reports on work every day as required by the Engineer.

2.9 CONSEQUENCES OF CANCELLATION:

Whenever BHEL exercises its authority to terminate the contract/withdraw a portion of work under clause 2.7, they may complete the work by any means at the contractor's risk and cost provided that in the event of the cost of completion as certified by the Site Engineer which is final and conclusive being less than contract cost, the advantage shall accrue to BHEL, and that if the cost of completion exceeds the moneys due to the contractor under the contract, the Contractor shall either pay the excess amount ordered by BHEL or the same shall be recovered from the contractor by any other means. This will be in addition to the forfeiture of Security Deposit and recovery of liquidated damages as per relevant clauses (2.7)

2.9.1 In case BHEL completes the work under the provision of this condition, the cost of such completion to be taken into account in determining the excess cost to be charged to the contract, shall consist of actual cost incurred in completion of work such as materials purchased and / or labour provided by BHEL, amounts paid to other agencies, etc. with an addition of such percentage to cover supervision and establishment charges as may be decided by BHEL.

2.10 **INSURANCE:**

2.10.1 BHEL/their customer shall arrange for insuring the materials/properties of BHEL/customer covering the risks during transit, storage, erection and commissioning.

2.10.2 It is the sole responsibility of the contractor to insure his workmen against accidents and injury while at work as required by relevant Rules and to pay compensation, if any, to workmen as per Workmen's compensation Act. The work will be carried out in a protected area and all the rules and regulations of the client /BHEL in the area of project which are in force from time to time will have to be followed by the contractor.

2.10.3 If due to negligence and or non-observation of safety and other precautions, any accident/injury occurs to any other persons/public, the contractor shall have to pay necessary compensation and other expense, if so decided by the appropriate authorities.

2.10.4 If due to contractor's carelessness, negligence or non-observance of safety precautions, damage to BHEL's /Customer's property and personnel should occur and if BHEL is unable to recover in full, cost from the insurance Company, the same will be recovered from the contractor.

2.10.5 It shall be the responsibility of the Contractor to provide security arrangement for the equipment/materials belonging to BHEL and handed over to the contractor for erection/transportation till the same are taken over by BHEL, after erection/returned to BHEL stores.

2.11 **STRIKES & LOCKOUTS:**

2.11.1 The contractor will be fully responsible for all the dispute and other issues connected with his labour. In the event of the contractor's labour resorting to strike or the contractor resorting to lockout and if the strike or the lockout declared is not settled within a period of one month, BHEL shall have the right to get the erection work executed employing its own labour or through any other agencies or both and the cost so incurred by BHEL shall be deducted from the Contractor's bills.

2.11.2 For all purposes whatsoever the employees of the Contractor shall not be deemed to be in the employment of BHEL.

2.12 **FORCE MAJEURE:**

2.12.1 The following shall amount to force majeure
Acts of God, Act of any Government, War, Sabotage, Riots, Civil commotion Police Action, Revolution, Flood, Fire , Cyclones, Earth quake and Epidemic and other similar causes over which the Contractor has no control**.**

2.12.2 If the Contractor suffers delay in the due execution of the contractual obligation due to delays caused by Force Majeure as defined above, the

agreed time of completion of the job covered by this contract or the obligation of the contractor shall be extended by a period of time equal to the period of delay provided that on the occurrence of any such contingency the Contractor immediately reports to BHEL in writing the causes of delay and the Contractor shall not be eligible for any compensation.

2.13 **GUARANTEE:**

Eventhough the work will be carried out under the supervision of BHEL Engineers the Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of twelve months from the date of completion of work as certified by the Engineer for good workmanship and shall rectify free of cost all defects due to faulty erection detected during the guarantee period starting from the date of the completion of rectification. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works at the Contractor's risk and cost, without prejudice to any other rights and recover the same from security deposit/other dues or by other legal means.

2.14 **ARBITRATION:**

All disputes between the parties to the contract arising out of or in relation to the contract, other than those for which the decision of the engineer or of any other person is by the contract expressed to be final and conclusive shall, after written notice by either party to the contract to other party be referred to sole arbitration of General Manager or his nominee. The arbitration shall be conducted in accordance with provisions of the Arbitration and Conciliation Act, 1996.

The parties to the contract understand and agree that it will have no objection than the General Manager or the person nominated as arbitrator had earlier in his official capacity dealt directly or indirectly with the matters to which the contract relates or that in the course of his official duties had expressed views on all or any of the matters in dispute or difference. The award of the arbitrator shall be final and binding on the parties to this contract.

In the event of the arbitrator dying, neglecting or refusing to act or resigning or being unable to act for any reason of his award being set aside by the court for any reasons; it shall be lawful for the General Manager or his successor, as the case may be either to act himself as the Arbitrator or to appoint another arbitrator in the place of the outgoing arbitrator in the manner aforesaid.

The arbitrator may from time to time with the consent of both the parties to the contract enlarge the time for making the award.

Work under the contract shall be continued during the arbitration proceedings. The venue of the arbitration shall be a place from which the contract is issued or such other place as the arbitrator at his discretion may determine.

2.15.0 SPECIFICATION FOR HEALTH, SAFETY AND ENVIRONMENT (HSE)

The contractor has to necessarily submit the safety plan while submitting the offer. The safety plan should indicate in detail the measures that would be taken by the contractor to ensure safety of men, equipment, material and environment during execution of the work. During negotiations before placing the work order and during execution of the contract, BHEL shall have right to review and suggest modifications in the safety plan. The contractor shall abide by BHEL decision in this respect . Tenders not accompanied with safety plan are liable for rejection.

2.15.1 SCOPE

This specification establishes the Health, Safety and Environment (HSE) management requirement to be complied with by the Contractors during construction.

Requirements stipulated in this specification shall supplement the requirements of HSE Management given in relevant Act(s) / legislations, General Conditions of Contract (GCC). Special Conditions of Contract (SCC) and job specification. Where different documents stipulate different requirements, the most stringent be adopted.

2.15.2 REFERENCES

This document should be read in conjunction with following

- General Conditions of Contract(GCC)
- Special Conditions of Contract (SCC)
- Scope of work
- Relevant IS Codes
- Reporting Formats

2.15.3 REQUIREMENTS OF HEALTH, SAFETY & ENVIRONMENT (HSE) MANAGEMENT SYSTEM TO BE COMPLIED BY CONTRACTORS

2.15.3.1 MANAGEMENT RESPONSIBILITY

a. The contractor to comply with HSE requirement at Construction sites as enclosed to cover commitment of their organization to ensure health, safety and environment aspects in their line of operations.

b. The HSE management system shall cover the HSE requirements including but not limited to what is specified under Para 2.15.1 and para 2.15.2 above.

c. Contractor shall be fully responsible for planning and implementing HSE requirements. Contractor as a minimum requirement shall designate/deploy the following to co-ordinate the above.

No of workers deployed upto 250 - Designate one safety Supervisor

Above 250 & upto 500 - Deploy one qualified and Experienced Safety Engineer/Officer

Above 500 (for every 500 or less) - One additional safety engineer/officer, as above.

d. Contractor shall indemnify & hold harmless BHEL/Customer & their representatives free from any and all liabilities arising out of non-fulfillment of HSE requirements.

e. The Contractor shall ensure that the Health, Safety and Environment (HSE) requirements are clearly understood & faithfully implemented at all levels at site.

f. BHEL shall promote and develop consciousness for Health, Safety and Environment among all personnel working for the contractor. Regular awareness programmes and work site meetings shall be arranged on HSE activities to cover hazard involved in various operations during construction.

g. The contractor shall arrange suitable first-aid measures such as First Aid Box, trained personnel to give First Aid and install fire protection measures such as adequate number of steel buckets with sand and water to the satisfaction of BHEL/customer.

h. Non-Conformance on HSE by Contractor (including his Sub-contractors) as brought out during review/audit by BHEL/customer representatives shall be resolved forthwith by Contractor. Compliance report shall be provided to BHEL.

i. The contractor shall ensure participation of his Resident Engineer/Site-in-Charge in the Safety Committee/HSE Committees meetings arranged by BHEL/customer. The compliance of any observations shall be arranged urgently. He shall assist BHEL/customer to achieve the targets set by them on HSE during the project implementation.

j. The Contractor shall adhere consistently to all provisions of HSE requirement In case of non-compliance or continuous failure in implementation of any of HSE provisions, BHEL/customer may impose stoppage of work without any cost & time implication to BHEL/customer and /or impose a suitable penalty for non-compliance with a notice of suitable period, upto a cumulative limit of 1.0% (one percent) of contract value. This penalty shall be in addition to all other penalties specified elsewhere in the contract. The decision of imposing stoppage of work, its extent & minor penalty shall rest with BHEL/customer & binding on the contractor.

k. All fatal accidents and other personnel accidents shall be investigated by a team of Contractor's senior personnel for root cause & recommended corrective and preventive actions. Findings shall be documented and suitable actions taken to avoid recurrences shall be communicated to BHEL/customer. BHEL/customer shall have the liberty to independently investigate such occurrences and Contractor shall extend all necessary help and co-operation in this regard.

2.15.3.2. **HOUSE KEEPING**

2.15.3.2.1 Contractor shall ensure that a high degree of house keeping is maintained and shall ensure interalia, the following

a) All surplus earth and debris are removed/disposed off from the working areas to identified location(s)

b) Unused/Surplus Cables, Steel items and steel scrap lying scattered at different places within the working areas are removed to identified location(s).

c) All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to identified locations.

d) Roads shall be kept clear and materials like pipes, steel, sand boulders, concrete, chips and brick etc., shall not be allowed on the roads to obstruct free movement of men & machinery.

e) Fabricated steel structural, pipes & piping materials shall be stacked properly for erection.

f) Water logging on roads shall not be allowed.

g) No parking of trucks/trolleys, cranes and trailers etc., shall be allowed on roads, which may obstruct the traffic movement.

h) Utmost care shall be taken to ensure overall cleanliness and proper upkeep of the working areas.

i) Trucks carrying sand, earth and pulverised materials etc, shall be covered while moving within the plant area.

In case of non-compliance of any of the above, BHEL shall have the liberty to get it done from some other agency at their risk and cost.

2.15.3.3. **HEALTH SAETY AND ENVIRONMENT**

- The Contractor shall provide safe means of access to any working place including provisions of suitable and sufficient scaffolding at various stages during all operations of the work for the safety of his workmen, and BHEL/customer. Contractor shall ensure deployment of appropriate

equipment and appliances for adequate safety and health of the workmen and protection of surrounding areas.

- The contractor shall ensure that all their staff and workers wear Safety helmet and Safety shoes. Contractor shall ensure use of safety belt, protective goggles, gloves etc., by the personnel as per job requirements. All these gadgets shall conform to relevant IS specifications or equivalent.

- The Contractor shall assign to his workmen, tasks commensurate with their qualification, experience and state of health for driving of vehicles, handling and erection of materials and equipment. All lifting equipment shall be tested certified for its capacity before use. Adequate and suitable lighting at every work place and approach thereto, shall be provided by the Contractor before starting the actual operations at night. It is mandatory for contractor to get his workmen medically examined/checked for fitness of work assigned once a year and furnish the certificate to that effect from a RMP/Govt. Hospital.

- Hazardous and / or toxic materials such as solvent, coating or thinners shall be stored in appropriate containers.

- All hazardous materials shall be labeled with the name of the materials, the hazards associated with its use and necessary precautions to be taken.

- Contractor shall ensure that during the performance of the work, all hazard of the health of personnel have been identified, assessed and eliminated.

- Chemical spills shall be contained & cleaned up immediately to prevent further contamination.

- All personnel exposed to physical agents such as ionizing or non-ionizing radiation, or similar other physical agents shall be provided with adequate shielding or protection commensurate with the type of exposure involved.

- Where contact or exposure of hazardous materials could exceed limits or could otherwise have harmful effects, appropriate personnel protective equipment such as gloves, goggles, aprons, chemicals resistant clothing and respirator shall be used.

- All persons deployed at site shall be knowledgeable of and comply with environmental laws, rules & regulations relating to the hazardous materials substances and wastes. Contractor shall not dump, release or otherwise discharge or dispose off any such materials without the express authorisation of BHEL/customer.

2.15.4 **DURING JOB EXECUTION**

Implement Health, Safety and Environment requirements including but not limited to as brought out under para 2.15.3. Contractor shall ensure to:

- Arrange workmen compensation insurance, registration under ESI Act, third party liability insurance etc., as applicable.

- Arrange all HSE permits before start of activities (as applicable) like hot work, confined space, work at heights, storage of chemical/explosive materials and its use and implement all precautions mentioned thereon.

- Submit timely the completed checklist on HSE activities, monthly HSE report, accident reports, investigation reports etc., as per BHEL/customer requirements. Compliance of instructions on HSE shall be done by Contractor and informed urgently to BHEL/customer.

- Ensure the Resident Engineer/Site in charge of the contractor shall attend all the Safety Committee/HSE meetings arranged by BHEL/Owner. In case of his absence from site that a second senior most personnel shall be nominated by him in advance and communicated to BHLE/customer.

- Display at site office and work locations caution boards, list of hospitals, emergency services available.

- Display posters, banners made available by BHEL for safe working to promote safety consciousness.

- Assist in HSE audits by BHEL/Customer and submit compliance report.

- Generate & submit HSE records/report as per HSE plan.

- Appraise BHEL/Owner on HSE activities at site.

2.15.4.1 **RELEVANT IS CODES FOR PERSONAL PROTECTION(suggested)**

IS 2925 - 1984	Industrial Safety helmets
IS 4770 - 1968	Rubber gloves for electrical purposes
IS 6994 - 1973 (Part I) IS 8807 - 1978 IS 8519 - 1977	Industrial Safety Gloves (Leather & cotton Gloves) & Body protection devices
IS 1989 - 1986 (Part I & III)	Leather safety boots and shoes
IS 3738 - 1975	Rubber knee boots
IS 5557 - 1969	Industrial and knee boots
IS 6519 - 1971	Code of practice for selection, care and repair of safety Foot Wear
IS 11226 – 1985	Leather safety footwear having direct moulding sole
IS 5983 - 1978	Eye protectors
IS 9167 - 1979	Ear protectors
IS 3521 - 1983	Industrial safety belts and harness

2.15.5 MONTHLY CHECKLIST CUM COMPLIANCE REPORT

(for compliance during execution)

PROJECT : CONTRACTOR :

DATE : OWNER :

INSPECTION BY

Note: Write 'NA' wherever the item is not applicable.

ITEM	YES	NO	REMARKS	ACTION
HOUSE KEEPING				
Waste containers provided and Used				
Sanitary facilities adequate and clean				
Passageways and Walkways clear				
General neatness of working areas				
Other				
PERSONAL PROTECTIVE EQUPT				
Goggles: Shields				
Face protection				
Hearing protection				
Safety shoes provided				
Hand protection				
Safety Belts				
Other				
EXCAVATIONS/ OPENINGS				
Openings properly covered or barricaded				
Excavations shored				
Excavations barricaded				
Overnight lighting provided				
Others				
WELDING, CUTTING				
Gas cylinders chained				

ITEM	YES	NO	REMARKS	ACTION
Upright				
Cables and hoses not obstructing				
Screens or shields used				
Flammable materials protected				
Fire extinguisher(s) Accessible				
Other				
SCAFFOLDING				
Fully decked platforms				
Guard and intermediate rails in place				
Toe boards in place				
Adequate shoring				
Adequate access				
Other				
LADDERS				
Extension side rails 1 m above				
Top of landing				
Properly secured				
Angle ± 70 from horizontal				
Other				
HOIST,CRANES AND DERRICKS				
Condition of slings, chains, hooks, & eyes O.K.				
Inspection and maintenance logs maintained				
Outriggers used				
Signs/barricades provided				
Signals observed and understood				
Qualified operators				
Other				
MACHINERY, TOOLS AND EQUIPMENT				
Proper instruction				
Safety devices				

ITEM	YES	NO	REMARKS	ACTION
Proper cords				
Inspection and maintenance				
Other				
VEHICLE AND TRAFFIC				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				
Other				
TEMPORARY FACILITIES				
Emergency instructions posted				
Fire extinguishers provided				
Fire-aid equipment available				
Secured against storm damage				
General Neatness				
In accordance with electrical requirements				
Other				
FIRE PREVENTION				
Personnel instructed				
Fire extinguishers checked				
No smoking in prohibited areas				
Hydrants clear				
Other				
ELECTRICAL				
Proper wiring				
ELCB’S provided				
Ground fault circuit interrupters				
Protection against damage				
Prevention of tripping hazards				
Others				
HANDLING AND STORAGE OF MATERIALS				

ITEM	YES	NO	REMARKS	ACTION
Properly stored or stacked				
Passageways clear				
Other				
FLAMMABLE GASES AND LIQUIDS				
Containers clearly identified				
Proper storage				
Fire extinguisher nearby				
Other				
WORKING AT HEIGHT				
Erection plan				
Safety belts and lanyards; chute lines				
Other				
ENVIRONMENT				
Chemical and other Effluents properly disposed				
Cleaning liquid of pipes disposed off properly				
Water used for hydro testing as per agreed procedure				
Lubricant waste/engine oils properly disposed				
Waste from Canteen, offices, sanitation etc., disposed properly				
Disposal of surplus earth, stripping materials, Oily rags and combustible materials done properly				
Green belt protection Hygienic conditions at labour camps O.K.?				
Availability of First Aid facilities				
Proper sanitation at site, office and Labour camps				
Arrangement of medical facilities				
Measures for dealing with Illness				

ITEM	YES	NO	REMARKS	ACTION
Availability of Potable drinking water for Workmen & staff.				

Signature of Resident Engineer with seal

2.15.6 ACCIDENT CUM FIRE REPORT

(To be submitted by the contractor after every accident within 24 hours of accident)

Name of the site **:……** Report No

Contractor **: ……**

Name of the injured &

Age **:…….**

Father's Name **: ……..**

Sub Contractor M/s **: ……..**

Date and Time of accident **: …….**

Location **: …….**

Brief Description of the accident :

Cause of the Accident :

Nature of Injury / Damage :

Medical aid provided / action taken :

Intimation to the local authorities :

Signature of the contractor with seal

Date :

To
Site Incharge / BHEL

2.15.7 SUPPLEMENTARY ACCIDENT & INVESTIGATION REPORT

Project :

Supplementary to Report No:

Site :

Date :

Contractor :

Name of the Injured :

Age :

Father's Name :

Subcontractor M/s :

Date and time of accident :

Location :

Brief Description and cause of accident :

Nature of injury / damage

Comments from the Medical Practitioner, who attended the victim/injured:

Suggested improvement in the working condition if any:

Loss of man hours and impact on site works:

Any other comment by the safety Officer:

Signature of the contractor
With seal

Date :

To :

2.15.8 MONTHLY HEALTH, SAFETY AND ENVIRONMENT (HSE) REPORT

(to be submitted by each contractor)

Actual work start date: For the month of:

Project: Report No.

Name of the contractor: Status as on:

Name of the work Name of the Safety Officer:

Item	This month	Cumulative
Total strength (staff + workmen)		
Number of HSE meetings organised at site		
Number of HSE awareness programmes attended at site		
Whether Workmen Compensation Policy taken	Yes / No	
Whether Workmen Compensation Policy is valid	Yes / No	
Whether workmen registered under ESI Act	Yes / No	
Number of fatal accidents		
Number of loss time accidents (other than fatal)		
Other accidents (non-loss time)		
Total number of accidents		
Total manhours worked		
Manhour loss due to fire and accidents		
Compensation cases raised with Insurance		
Compensation cases resolved and paid to workmen		
Remarks		

Date

Safety Officer / Resident Engineer
(Signature & Name)

To
Site Incharge, BHEL

SALIENT PROVISIONS OF
CONTRACT LABOUR (REGULATION & ABOLITION) ACT 1970

A. The Act applies to every establishment in which twenty or more workmen are employed or were employed any day in the preceeding twelve months, as contract labour.

B. CONTRACTOR

1. In relation to an establishment, means a person who undertakes to produce a given result for the establishment, other than a mere supply of goods or articles of manufacture to such establishment, through contract labour (OR)

2. Who supplies contract labour for any work of the establishment and includes a subcontractor.

C. " Establishment" means:

i. any office or department of the Government or a local authority, or

ii. any place where any industry, trade, business, manufacture or occupation is carried on

D. "Principal Employer" means:

In any other establishment, any person responsible for the supervision and control of the establishment.

E. "Workmen" means:

Any person employed in or in connection with the work of any establishment to do any skilled, semi-skilled or unskilled manual, supervisory, technical or clerical work for hire or reward, whether the terms of employment be expressed or implied.

F. Notes – "Contractor" – The definition of the expression "Contractor" has two wings. One is in relation to the establishment in which he contracts to supply labour on contract and another in relation to the contractor himself. Any contractor whose work is to supply contract labour for any work in any establishment, including a sub-contractor will be governed by the Act, provided he is employing twenty or more persons.

G. An establishment engaged in construction work or manufacturing process might either employ labour through a contractor or it might entrust the execution of the work itself to a contractor who will employ his own workmen.

H. The usual test is whether the employer has control over the labour and actual execution of the work.

I. In all other establishment the person in the control of the establishment will be the principal employer. The importance of the definition of the principal employer lies in the fact that it is he who engages the contract labour and who is made responsible for due observance and discharge by the contractor of the duties and obligations enjoyed on him by the Act.

J. Liability of principal employer in certain cases (Section – 20)

I. If any amenity required to be provided under Section 16, Section 17, Section 18, or Section 19 for the benefit of the contractor within the time prescribed therefor such amenity shall be provided by the principal employer within such time as may be prescribed.

II. Responsibility for payment of wages.

a) Contractor is responsible for payment of wages to each worker employed by him as contract labour and wages shall be paid before the expiry of such period as may be prescribed.

b) Principal employer will nominate a representative to be present at the time of disbursement of wages by the contractor and certify the amount paid as wages.

c) It is the duty of the contractor to ensure disbursement of wages in the presence of authorized representative of principle employer.

d) In case the contractor fails to make payment of wages within the prescribed period or make short payment, then the Principal Employer shall be liable to make payment of wages in full or the unpaid balance due as the case may be to the contract labour employed by the contractor and recover the amount so paid from the contractor either by reduction from any amount payable or as a debt payable by the contractor.

K. Registers and other records maintained by the contractor (Sec.29)

1. Form – 13 (Rule 75) – Register of workmen employed by the contractor
2. Form – 14 (Rule 76) – Employment Card –
3. Form – 15 (Rule 77) – Service Certificate
4. Form – 16 (Rule 78) (1) (a) (I) – Muster Roll
5. Form – 17 (Rule 78) (1) (a) (I) – Register of Wages
6. Form – 18 (Rule (1) (a) (I) – Register of Wages cum Muster Roll
7. Form – 19 (Rule 78 (1) (b) – Wage Slip
8. Form – 20 (Rule 78) (1) (a) (ii) –Register of deductions for damage or loss
9. Form – 21 (Rule 78) (1) (a) (ii) – Register of Fines

10. Form – 22 (Rule 78) (1) (a) (ii) – Register of Advances
11. Form – 23 (Rule 78) (1) (a) (iii) – Register of Overtime
12. Form – 24 (Rule 82) (1) – Half yearly return to be sent by the Contractor to the Licensing Officer.

13. Display of Notice Board with details of work, No. of workers engaged, Rate of wages paid, date of payment of wages, date of payment of unpaid wages, name of the Principle employer, Name and address of the Inspecting Officer in Hindi, English and local languages at a prominent place.

14. Display of Labour Licence obtained from the Licencing officer

15. Display of Extract of Contract Labour (Regulation and Abolition) Act 1970 in Hindi, English and local languages.

L. Compliance by the contractor on commencement of work and completion of work.

1. Application for licence in Form – IV (Rule 21 (1) to be submitted to the Licensing Authority along with Form – V – Form of Certificate by the Principle Employer for obtaining labour License.

2. On obtaining labour licence, Form VI – A rule 25 (2) (viii) to be submitted by the contractor regarding commencement / completion of contract work to the Licensing Officer /Inspecting Authority.

3. Form – VII Rule 29 (2) to be submitted by the contractor for application of renewal of license.

S.17 Rest Rooms

(1) In every place wherein contract labour is required to halt at night in connection with the work of an establishment.

a. to which this Act applies and

b. in which work requiring employment on contract labour is likely to continue for such period as may be prescribed.

These shall be provided and maintained by the contractor for the use of contract labour such number of rest rooms or such other suitable alternative accommodation within such time as may be prescribed.

(2) The rest rooms or the alternative accommodation to be provided under sub-section (1) shall be sufficiently lighted and ventilated and shall be maintained in a clean and comfortable condition.

S.18 Other facilities

It shall be the duty of every contractor employing contract labour in connection with the work of an establishment to which this Act applies, to provide and maintain:

a. sufficient supply of wholesome drinking water for the contract labour at convenient places;
b. sufficient number of latrines and urinals of the prescribed specification so situated as to be convenient and accessible to the contract labour in the establishment; and
c. Washing facilities:

S.19 First aid facilities:

1. These shall be provided and maintained by the contractor so as to be readily accessible during all working hours and a first aid box equipped with the prescribed contents at every place where contract labour is employed by him.

2. Every principal employer shall nominate a representative duly authorized by him to be present at the time of disbursement of wages by the contractor and it shall be the duty of such representative to certify the amounts paid as wages in such manner as may be prescribed.

3. It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the authorized representative of the principal employer.

3. In case the contractor fails to make payment of wages within the prescribed period or makes short payment then the principal employer shall be liable to make payment of wages in full or the unpaid balance due, as the case may be, to the contract labour employed by the contractor and recover the amounts so paid from the contractor either by deduction from any amount payable to the contractor under the contract or as a debt payable by the contractor.

II . SALIENT PROVISIONS AND COMPLIANCE OF WORKMEN'S COMPENSATION ACT 1923

A An Act which provides for payment by certain Classes of employers to the workmen compensation for the injury by accident.

B. Employer's liability for compensation – Sec 3 – If personal injury is caused to a workmen by accident arising out of and in the course of employment, his employer shall be liable to pay compensation in accordance with the provisions of this Act.

C. Compensation to be paid when due and for default, penalty will be levied from the contractor.

D. For the purpose of calculation of compensation as per the Act,

1) the monthly wages means average amount payable for a month of service to the workmen, during the twelve months preceding the accident.
2) Employee who is drawing monthly wages of more than Rs.4000/- would be treated as four thousand.
3) Employees who are drawing monthly wages of less than Rs.4000/- the monthly wages would be the actual wage drawn.

E. Where temporary settlement – whether total or partial results from the injury, a half monthly payment of the sum equivalent to 25% of monthly wages of the workmen is to be paid by the employer to the workmen.

F No payment of compensation in respect of a workmen whose injury has resulted in death, and no payment of lump sum as compensation to a women or a person under legal disability shall be made otherwise by depositing to the Commissioner and no such payment made directly by an employer shall be deemed to be a payment of compensation.

G In case of fatal accident , the employer is to submit Form EE Rule – 11 – Report of Fatal Accident to the workmen's compensation Commissioner within 72 hours from the date of occurrence of accident.

H. Employer should deposit the compensation for fatal accident in Form 'A' to the workmen Commissioner.

I. In case of partial permanent disablement, memorandum of agreement in Form K,L,M are to be registered with Workmen Compensation Commissioner before disbursing the compensation amount to the Workmen.

III. SALIENT PROVISIONS AND COMPLIANCE OF EMPLOYEES' STATE INSURANCE ACT 1948

A. An Act to provide for certain benefits to employees in case of sickness, maternity and employment injury and to make provision for certain other matters in relation thereto.

B. An employee means any person employed for wages in or in connection with the work of a factory or establishment to which this Act applies and

1. Who is directly employed by the Principal employer or on any work of, incidental or preliminary to or connected with the work of, the factory or establishment whether such work is done by the employee in the factory or establishment or elsewhere or

2. Who is employed or through and immediate employer on the premises of the factory or establishment or under the supervision of the principle employer or his agent on work which is ordinarily part of the work of the factory or establishment or which is preliminary to the work carried on in or incidental to the purpose of the factory or establishment ; or

3. Whose services are temporarily lent on hire to the principal employer by the person with whom the person whose services are so lent or let on hire has entered into a contract of service; and includes any person employed for wages on any work connected with the administration of the factory or establishment or any part, department or branch thereof or with the purchase of raw materials for, or the distribution or sale of the products of, the factory or establishment;

    1. (or any person engaged as an apprentice, not being an apprentice engaged under the Apprentices' Act, 1961 (52 of 1961), or under the standing orders of the establishment: but does not include)

    2. (a) any member of the Indian naval, military or air forces; (or)
       (b) any person so employed whose wages(excluding remuneration for overtime work) exceed (Such wages as may be prescribed by the Central Government) a month:

Provided that an employee whose wages (excluding remuneration for overtime work) exceed (such wages as may be prescribed by the Central Government) a month at any time after (and not before) the beginning of the contribution period, shall continue to be an employee until the end of that period;

C. 'Principal employer 'mean'

(i) in a factory, the owner or occupier of the factory and includes the managing agent of such owner or occupier, the legal representative of a deceased owner or occupier, and where a person has been named as the

manager of the factory under the Factories' Act 1948 (63 of 1948), the person so named;

(ii) in any establishment under the control of any department of any Government in India, the authority appointed by such Government in this behalf or where no authority is so appointed, the head of the department;

(iii) in any other establishment, any person responsible for the supervision and control of the establishment.

D. Compliance by the Contractors:

(i) To open ESI Code No. for remitting the contribution both employer and employee every month for the workmen engaged by them.

(ii) Remitting the contributions in the prescribed format in Form – 6 regularly every month.

(iii) Submission of Form – 1, Form – 1 A, Form – 1B, Form –4, Form – 4A, Form –1 6 (Accident Report) and Form – 17.

(iv) Monthly details of remittance along with salary should be submitted to BHEL.

(v) Yearly return of details of Wages, details of ESI recovery, details of remittance to be submitted to BHEL.

(vi) On completion of the work ESI clearance certificate obtained from local ESI authorities is to be submitted to BHEL for enabling to release the final bill.

E. Wherever ESI Act is not applicable, the contractors shall have to cover their employees under Workmen Compensation Act 1923 by availing an insurance policy under the scheme of WC Insurance.

F. All Government owned Insurance companies issue Workmen Compensation Insurance Policies as per term applicable. Insurance shall cover all Workmen employed by the contractor on any given date.

IV. MINIMUM WAGES ACT 1948
Salient features

A. An Act to provide minimum statutory wages for scheduled employment and to provide maximum daily working hours, weekly rest and overtime.

B. It applies to all establishments employing one or more persons in any scheduled employment

C. Compliance by the contractor
(i) To pay the prescribed minimum wages or more to the Workmen engaged by them.
(ii) Displaying abstract of the Act in English and local language in Form 9-A
(iii) Submission of Annual Return in Form – 3 to the statutory authorities.

V. EMPLOYEES' PROVIDENT FUND AND MISCELLANEOUS PROVISION ACT 1952
(Salient features)

A. An Act to provide for the institution of Provident Funds, Pension and Depositing in Linked Insurance Fund.

B. It applies to all Contract Labour employed by the Contractor even for casual labour since the Principal Employer's establishment where the contractor is executing a job has already employed more than 20 workmen.

C. The Act includes the contract labour as an employee who is employed for Wages in any kind of work and who gets his wages directly or indirectly from the employer and includes any person employed by or through a Contractor in or in connection with the work of the establishment.

D. Compliance by the Contractor:-
(i) The contractor should apply for PF Code while submitting his Annual Balance Sheet and other documents required to the Regional provident Fund Commissioner.

(ii) If not, the contractor should get an additional code number from the Principal employer's code number and deposit the PF remittances regularly.

(iii) Copies of monthly remittances on the prescribed forms should be submitted to BHEL as a proof of compliance along with wage sheet.

(iv) Yearly submission of return indicating month wise salary, recoveries of PF and employers contribution and total reconciliation of the above in Form – 3A

(v) On joining the above scheme, Membership form, Nomination forms and other related forms are to be submitted to PF authorities by the contractor.

(vi)On completion of the works, the contractor should obtain a clearance certificate from PF authorities with total reconciliation of wages paid, PF recovered and remitted as per extant rules of the above Act for further processing of final bills by BHEL.

(vii) The contractor shall also arrange to obtain yearly statements of PF remittances from PF authorities in respect of each employee for whom he has remitted PF Monthly and issue the same to concerned workmen periodically.

SECTION III

COMMON CONDITIONS OF CONTRACT

3.1 SCOPE OF CONTRACT

3.1.1 The Intent of this specification is to provide erection and commissioning services for execution of projects according to most modern and proven techniques and codes. The omission of specific reference to any method and equipment or material necessary for the proper and efficient services towards installation of the Plant shall not relieve the contractor of the responsibility of providing such services, facilities to complete the project or portion of project awarded to him. The quoted rate shall deem to be inclusive of all such contingencies.

3.1.2 The contractor shall carry out the work in accordance with instructions/ drawings/ specification/ standard practices supplied by BHEL from time to time.

3.1.3 Provision of all types of labor, Supervisors, Engineers, watch and ward as required tools and tackles as required, consumables as required under various clauses of tender specification for handling transportation, erection, testing and commissioning.

3.1.4 Proper out-turn as per BHEL plan and commitment.

3.1.5 Completion of work in time.

3.1.6 Good quality and accurate workmanship for proper performance of equipment / systems.

3.1.7 Preservation of all components at all stages of pre-assembly/erection/testing and commissioning till completion of trial run of unit.

3.2 FACILITIES TO BE PROVIDED BY BHEL:

3.2.1 OPEN SPACE:

Open space for building of temporary office shed / stores shed will be provided free of cost. Contractor has to make his own arrangements for labour colony.

3.2.2 ELECTRICITY:

For construction purpose, electricity will be provided free of charge at one single point. Further distribution shall be arranged by the contractor for the site requirement at his cost.

BHEL is not responsible for any loss or damage to the contractor's equipment as a result of variation in voltage / frequency or interruptions in power supply.

3.2.3 WATER:

For construction and drinking purpose water will be provided at one single point, free of charge, as provided by customer to BHEL. Further distribution shall be arranged by the contractor at his own cost.

3.2.4 TOOLS & TACKLES:

All the Tools & Plants and Instruments required for the complete erection of components shall be arranged by the contractor and quoted rate shall be inclusive of such requirements. The stipulation pertaining to these are detailed in clause 3.6 of Tender specification.

3.2.5 CONSUMABLES:

All consumables, Electrodes including Oxygen / Acetylene, Argon, Gases, Paints etc, shall be arranged by the contractor at their own cost.

3.3 FACILITIES TO BE PROVIDED AND DEVELOPED BY THE TENDERER / CONTRACTOR AT HIS COST.

3.3.1 CIVIL CONSTRUCTION:

It shall be the responsibility of the contractor to construct his own office shed, stores shed, with all facilities like electricity, water supply, sanitary arrangements in the area allotted to him for the purpose.

3.3.2 WATER DISTRIBUTION:

Distribution of water for construction purpose and as well as drinking purpose from the single point provided by BHEL to various work-fronts shall be contractor's responsibility and at his cost.

3.3.3 ELECTRICITY DISTRIBUTION:

Provision of distribution of electrical power from the given single central common point to the required places with proper distribution boards approved cable and cable laying including supply of all materials like cables, switch boards, pipes etc. observing the safety rules laid down by electrical authority of the State / BHEL / their customer with appropriate statutory requirements shall be the responsibility of the Tenderer / contractor.

3.3.4 POSSESSION OF GENERATORS :

As there are bound to be interruptions in regular power supply, power cut / load shedding in any construction sites, due to inherent power shortage in State on this account, suitable extension of time, if found necessary only be given and contractor is not entitled for any compensation. It shall be the responsibility of the tenderer / contractor to provide, maintain the complete installation on the load side of the supply with due regard to safety requirements at site. The contractor shall adjust his working shifts accordingly and deploy additional manpower, if necessary to achieve the target. It shall be the responsibility of the contractor to have at least 2 to 4 Nos diesel operated Generator sets to get urgent and important work to go on without interruptions.

The consumables required to operate the generators are to be provided by the tenderer.

3.3.5 LIGHTING FACILITY :

Adequate lighting facilities such as flood lamps, low volt hand lamps and area lighting shall be arranged by the contractor at the site of construction, contractor's material storage area etc. at his cost.

3.3.6 POWER DISTRIBUTION :

For the purpose of planning, contractor shall furnish along with tender the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.

3.3.7 CONTRACTOR'S OBLIGATION ON COMPLETION :

On Completion of work all the temporary buildings, structures, pipe lines, cable 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 expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

3.4 GASES :

3.4.1 All required gases like Oxygen/ Acetylene/ Argon/ Nitrogen required for work shall be supplied by the Contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of those gases. Non-availability of gases cannot be considered as reasons for not attaining the required progress of erection.

3.4.2 BHEL reserves the right to reject the use of any gas in case required purity is not maintained.

3.4.3 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.

3.4.4 The contractor shall ensure safe keeping of the inflammable cylinder at a separate place away from normal habit with proper security etc.

3.4.5 The contractor shall arrange air / gas manifold ensuring proper distribution and reduction of handling time.

3.5 ELECTRODES & FILLER WIRES :

3.5.1 All required electrodes shall be arranged by contractor, at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement regarding suppliers, type of electrodes on receipt of the electrodes at site it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch No., and date of expiry etc.

3.5.2 Storage of electrodes shall be done in an air conditioned / humidity controlled room as per requirement, at his own cost by the contractor.

3.5.3 All low electrodes shall be baked / dried in the electrode drying oven (range 375 deg. C – 425 deg. C) to the temperature and period specified by the BHEL Engineer before they are used in erection work and each Welder should be provided with one portable electrode drying oven at the work spot. Electrode drying oven and portable drying ovens shall be provided by the contractor at his cost.

3.5.4 In case of improper arrangement of procurement of above electrodes BHEL reserve the right to procure the same from any source and recover the cost from the contractor’s first subsequent bill at market value plus departmental charges of BHEL. Postponement of such recovery is not permissible.

3.5.5 BHEL reserves the right to reject the use of any electrodes at any stage if found defective because of bad quality, improper storage, date of expiry, unapproved type of electrodes etc. It shall be the responsibility of the contractor to replace at his cost without loss of time.

3.6 TOOLS & TACKLES

3.6.1 All T & P required for the satisfactory execution of work shall be arranged by contractor at his cost as specified in clause 3.2.4.

3.6.2 All the T & P arranged by contractor including electrical connections wherein required shall be reliable/proven/tested and necessary test certificate.

3.6.3 All instruments, measuring tools etc. are to be calibrated periodically as per the requirement of BHEL and necessary calibration certificates are to be submitted to BHEL before use.

3.6.4 All the T & P, lifting tackles including wire ropes, slings shackles and electrically operated equipment shall be got approved by BHEL Engineer before they are actually put on use. Test certificates should be submitted before their usage.

3.6.5 For the movement of cranes etc. it may become necessary to lay sleeper bed for obtaining leveled safe approach for usage of equipment. It shall be the contractor's responsibility to lay necessary sleepers. Required sleepers shall be arranged by the contractor at their cost.

3.7 SUPERVISORY STAFF AND WORKMEN

3.7.1 The Contractor shall deploy experienced Engineers, Supervisors all the skilled workmen like High Pressure Welders (gas, TIG and arc) Carbon, alloy steel welders, Gas cutters, electricians, Riggers, Serangs, Erectors, carpenters, fitters etc. in addition to other skilled semi-skilled and unskilled workmen required for all the works of handling and transportation from site storage to erection site, transportation, erection, testing and commissioning contemplated under this specification. Only fully trained and competent men with previous experience of the job shall be employed. They shall hold valid certificates wherever necessary.

3.7.2 BHEL reserves the right to decide on the suitability of the workers and other personnel who will be employed by the contractor, BHEL reserves right to insist on removal of any employee of the contractor at any time, if they find him unsuitable and the contractor shall forthwith remove him.

3.7.3 The supervisory staff employed by the contractor shall be qualified Engineers and experienced in the area of work. They shall ensure proper out-turn of work and discipline on the part of labour put on the job by the contractor and in general see that the works are carried out in safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractor's of BHEL's client.

3.7.4 The Contractor shall also furnish DAILY & MONTHLY report showing the number of employees engaged in various categories of work and a progress report of work as required by BHEL Engineer.

3.7.5 The work shall be executed under the usual conditions existing in major power plant construction and in conjunction with numerous other operations at site. The bidder and his personnel shall co-operate with other personnel contractor coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

3.7.6 The contractor's supervisory staff shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work, good workmanship and aesthetic finish are essential part of this contract. The contractor shall be responsible to ensure that assembly and workmanship conform to the dimensions and tolerances given in the drawings/instructions given by BHEL Engineers from time to time.

3.7.7 The contractor shall employ the necessary number of qualified and approved full time electricians at his cost to maintain his temporary electrical installation till the completion of work.

3.7.8 It is the responsibility of the bidder to carryout the work for achieving the target set by BHEL and also during erection, commissioning and testing period. The contractor's quoted rate shall include all these contingencies.

3.7.9 If the contractor or his workmen or employees shall break, deface, injure or destroy any part of a building, road, kerb, fence, enclosure, water pipes, cables, drains, electric or telephone posts or wires, trees or any other property or to any part of erected components etc. The contractor shall make the same good at his own expense or in default.

3.7.10 BHEL may cause the same to be good by other workmen or by other means and deduct the expenses (of which BHEL's decision is final) from any money due to the contractor.

3.8.0 SCOPE OF MATERIAL HANDLING AND SITE STORAGE AND OTHER RESPONSIBILITIES:

3.8.1 While BHEL will endeavour to store/stack/identify materials properly in their open/closed storage yard/shed it shall be contractor's responsibility to assist BHEL in identifying material well in time for erection, taking delivery of the same in time following the procedure indicated by BHEL and transport the material safely to pre-assembly yard/erection site in time according to programme.

3.8.2 The contractor shall identify necessary supervisor/labour for the above work in sufficient quantity as may be needed by BHEL for areas covering their scope.

3.8.3 It shall be contractor's responsibility to arrange necessary cranes/tractors, trailer or trucks/slings/tools and tackles/labour including operators and on to transport equipment, move it to erection site/pre-assembly yard and unload the same at pre-assembly yard/ erection site and the quoted rate shall include the same.

3.8.4 All equipment so used by contractor shall be of proven quality and safe in operation as approved by the statutory authorities as per the law in force.

3.8.5 Any loss/damage to materials issued to contractor shall be made good by him or BHEL will arrange for replacement at cost recovery basis and decision of BHEL shall be final. Any loss/ damage must be intimated to site in-charge of BHEL in writing within 24 hours of the occurrence.

3.8.6 All the surplus damaged, unused materials, package materials/containers/special transporting frames, gunny bags etc. supplied by BHEL shall be returned to the BHEL Stores by the contractor immediately.

3.8.7 The contractor shall take delivery of the components and equipments and special consumables from the storage area after getting the approval of the BHEL Engineer on standard indent forms to be specified by BHEL. At periodic/intervals of work, complete and detailed account of the equipment so erected and electrodes used shall be submitted to the BHEL Engineer.

3.8.8 The contractor shall submit monthly plan for erection and the same will be mutually agreed upon after discussion. The contractor shall arrange for Engineers, Supervisors and labour force and tools and plants and consumables to suit the above plan and execute the work accordingly.

3.8.9 The Contractor shall have total responsibility for all equipment and materials in his custody, stores, loose, semi-assembled, assembled or erected by him at site.

3.8.10 The contractor shall make suitable security arrangement including employment of security personnel to ensure the protection of all materials/equipments and works from theft, fire, pilferage and any other damage and loss.

3.8.11 The contractor shall ensure that the packing materials and protection devices used for the various equipments during transit and storage are removed before these equipments are installed.

3.8.12 All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc. shall be used for unloading and / or handling of the equipments without the specific written permission of the Engineer. The equipments from the storage yard shall be moved to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage for such equipments at site.

3.8.13 The work covered under this scope of work is of highly sophisticated nature requiring best quality / proven workmanship engineering and construction management. It should also ensure successful and timely commercial operation of equipment installed. The contractor must have adequate quantity of precision tools, construction aids in possession. Contractor must also have adequate trained qualified and experienced supervisory staff and skilled personnel.

3.8.14 All the necessary certificates and licenses required to carry out this scope of work are to arranged by the contractor then and there at no extra cost.

3.8.15 The contractor shall take all reasonable care to protect the material and work till such time the erected equipment has been taken over by BHEL/their client. Necessary suitable temporary fencing and lighting shall have to be provided by the contractor as a safety measure against accident and damage of property of BHEL. Suitable caution notices shall be displayed where access to any part may be deemed to be unsafe and hazardous.

3.8.16 The contractor shall be responsible for taking all safety precautions during the construction and leaving the site safe at all times. When the work is temporarily suspended he shall protect all construction materials, equipments and facilities from causing damage to existing property interfering with the operations of the station when it goes into service. The contractor shall comply with all applicable provisions of the safety regulations clean-up programme and other precautionary measures which the BHEL has in effect at the site.

3.8.17 All lifting tackles including wire ropes, slings, shackles etc. used by the contractor shall be got approved by BHEL Engineer at site before they are actually put on the work. It will be the responsibility of the contractor to ensure safe lifting of the equipment taking due precautions to avoid any accidents and damage to other equipments and personnel. All piping shall be adequately supported and protected to prevent damage during handling erection. The history cards for major equipments to be maintained by the contractor.

3.8.18 The contractor shall take delivery of equipment from storage yard/stores/sheds. He shall also make arrangements for verification of equipment maintain records and keep 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 BHEL's client. The stolen/lost damaged goods shall have to be made good by the contractor at his own cost.

3.8.19 Sometimes it may become necessary for the contractor to handle certain unrequired components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.

3.9.0 PRESERVATION OF COMPONENTS

3.9.1 It shall be the responsibility of the contractor to apply touch up painting on all equipment before erection. It shall be contractor's responsibility to arrange for required labour, brush and other consumables like cotton waste, cloth etc. for carrying out preservative painting. The quoted rates shall be inclusive of above work. The required paint and thinner shall be arranged by BHEL at free of cost.

3.9.2 The contractor shall effectively protect the finished work from action of weather and from damage or defacement and shall cover the finished parts, then and there for their protection.

3.9.3 Any failure on the part of contractor to carry out work according to above clauses will entail BHEL to carry out the job from any other party and recover the cost from contractor.

3.9.4 Due to atmospheric conditions erected materials are likely to get rusted more frequently. It is the responsibility of the contractor to preserve the erection materials drawn from stores for erection till these are commissioned and handed over to customer. All consumables including painting brush, emery paper, cotton waste, cloth etc. have to be procured by the contractor at his cost. The required preservative paint and Thinner shall be arranged by BHEL free of cost. The contractor should ensure that the materials are not rusted on any account till they are handed over to customer. The

decision of the BHEL Engineer is final with regard to frequency of application of paint.

3.10.0 DRAWINGS AND DOCUMENTS

3.10.1 The detailed drawing specification available with BHEL Engineers will form part of this tender specification. These documents will be made available to the contractor during execution of work at site.

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

3.10.3 The data furnished in various appendices and the drawings enclosed with this Tender Specification, describes 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 scales of work.

3.10.4 Should any error or ambiguity be discovered in the specification, or information, the contractor shall forthwith bring the same to the notice of BHEL before commencement of work. BHEL's interpretation in such cases shall be final and binding on the contractor.

3.10.5 Deviation from design dimensions should not exceed permissible limit. The contractor shall not correct or alter any dimensions/details without specific approval of BHEL.

3.11.0 SITE CLEANLINES AND SAFETY REQUIREMENTS

3.11.1 Contractor shall strictly follow all safety regulations/conditions as per clause 2.15 and its sub clauses of General Conditions of Contract booklet enclosed with this tender.

3.11.2 Non-conformity of safety rules and safety appliances will be viewed seriously and the BHEL has right to impose fines on the contractors as under: BHEL Engineer's decision is final and binding in this regard.

SNo	SAFETY MEASURES	Fine (Rs)
01	Not wearing safety helmet	50/-
02	Not wearing safety belt	100/-
03	Grinding without goggles	50/-
04	Not using 24V supply for internal work	500/-
05	Electrical plugs not used for hand machines	100/-
06	Not slinging properly	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 properly	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 elec. Winches which are being operated dangerously	500/-
13	Improper earthing of electrical T & Ps	500/-

3.11.3 The contractor should exclusively deploy one Safety Engineer along with a safety supervisor for effective implementation and co-ordination of safe working conditions.

3.11.4 Contractor shall necessarily fill up the safety plan format available in general conditions of contract booklet enclosed with this tender and submit along with their offer.

3.11.5 CONTRACTOR SHALL DEPLOY A SAFETY OFFICER EXCLUSIVELY TO HANDLE SAFETY REQUIREMENT.

3.12.0 PROGRESS OF WORK

3.12.1 During the course of erection if the progress is found unsatisfactory or if the target dates fixed from time to time for every milestone are to be advanced or in the opinion of BHEL, if it is found that the skilled workmen like fitters, operators, technicians etc. employed are not sufficient, BHEL will induct required additional workmen to improve the progress or take over a part of the job and get it done on risk and cost of the contractor and recover from contractor's bill, all charges incurred on this account including all expenses together with BHEL overheads from contractor's bill.

3.12.2 The contractor shall submit daily, weekly and monthly progress reports, manpower reports, material reports, consumables reports and other reports considered necessary by the BHEL Engineer.

The manpower reports shall clearly indicate the manpower deployed category wise daily specifying also the activities in which they are engaged.

3.12.3 The progress reports shall indicate the progress achieved against planned with reasons indicating delays if any and shall give remedial action which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original programme and the slippage do not accumulate and affect the overall programme in a format designed and approved by BHEL site engineer.

3.12.4 The contractor shall arrange for weekly progress review meeting with the "Engineers" at site during which actual progress during the week vis-à-vis scheduled programme shall be discussed for action to be taken for achieving targets. The programme for subsequent work shall also be presented by contractor for discussion. The contractor shall constantly update/revise his work programme to meet the overall requirements and suit the material availability.

3.12.5 The contractor shall arrange for submitting three sets of progress photographs every month to BHEL office the areas to be photographed will be as per the instruction of BHEL Engineer. The quoted rate shall include this contingency.

3.12.6 The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials inside the site premises, without the Entry Gate Pass these materials will not be allowed to be taken outside.

3.12.7 The contractor shall maintain a record in the form as prescribed by BHEL for all operations carried out on each weld and maintain a record indicating the number of welds, the name of welders who welded the same, date and time of start and completion, preheat temperature, radiographic results, rejections, if any, percentage of rejection, etc. and submit copies of the same to BHEL Engineer, as required.

3.13.0 SPECIFIC REQUIREMENTS FOR ISO 9001-2000

IMPORTANT NOTE

Contractors shall ensure that all their Staff/Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on ISO 9001 - 2000 Standards.

Contractors shall ensure that the Quality is maintained in all the works connected with this contract at all stages of the requirement of BHEL.

Contractor shall ensure that all Inspection, Measuring and Testing equipment that are used, whether owned by the contractors or used on loan, are calibrated by the authorized agencies and the valid calibration certificate will be available with them for verification by BHEL. A list of such instruments possessed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.

Contractors shall arrange for the inspection of the works at various stages as required by BHEL. Immediate corrective action shall be taken by the contractors for the non-conformances if any, observed and pointed out by BHEL.

3.14.0 INSPECTION / QUALITY ASSURANCE / QUALITY CONTROL STATUTORY INSPECTION

Various Inspection / quality control / quality assurance procedures/methods at various stages of erection and commissioning will be as per BHEL / Customer quality control procedure/codes/IBR and other statutory provisions and as per BHEL Engineer’s instructions.

Preparation of quality assurance log sheets and protocols with customer’s Engineers, welding logs and other quality control and quality assurance documentation as per BHEL Engineer’s Instructions, is within the scope of work / specification.

The protocols between contractor and customer/BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of Installation, generally as per the requirement of Customer/BHEL. This is necessary to ensure elimination of errors or keeping them within

tolerable limits and to avoid accumulation and multiplication of errors.

A Daily log Book should be maintained by every supervisor/Engineer of contractor on the job in Duplicate (One for BHEL and one for Contractor) for detailing and incorporating Alignment/clearance/centering/Leveling Readings and Inspection details of various Electrical and C & I works.

All the Electrical/Technical Measuring and Testing Instruments/Gauges, Feeler Gauges, Highest Gauges Dial Gauges, Micrometers, Levels Spirit Levels, Surface plates, straight Edges, vernier calipers and all measuring instruments shall be provided by the contractor for checking, leveling, Alignment, Centering etc of Erected Equipments at various stages. The Instruments / gauges / Tools etc. provided should be of Brand, Quality and Accuracy, Specified by BHEL Engineer and should have necessary Calibration and other Certificates as per the Requirements BHEL Engineer.

Total Quality is the Watch Ward of the work and standards, Procedures laid down by BHEL. We shall follow all the Instructions as per BHEL Drawings and Quality / Standards. Contractor shall provide for the services of quality Assurance Engineer.

3.15.0 STAGE INSPECTION BY FES / QA ENGINEERS :

Apart from Day-to-Day Inspection by BHEL Engineers Stationed at site and also by Customer's Engineers, Stage Inspection of Equipment under Erection and commissioning at various stages of Erection and commissioning by TEAMS of Engineers from Field Engineering Services of BHEL's Manufacturing units and Quality Assurance Teams from Field Quality Assurance Unit/ Factory Quality Assurance and commissioning Engineers Contract shall arrange all labour, Tools and Tackles, etc. for such stage inspections free of cost.

Any modifications suggested by FES and QA Engineers Team shall be carried out. Claims of Contractor, if any shall be dealt as applicable.

Any minor rectifications of minor repairs of defective work found out during stage Inspection shall be rectified free of cost, by the contractor.

Any major rectification or major repairs of defective work found out during stage inspection verification / checking but not attributable to contractor shall also be carried out. Claims of contractor, if any, shall be dealt as applicable.

3.16 STATUTORY INSPECTION

3.16.1 The scope includes getting the approvals from the Statutory Authorities like Boiler inspector and Labour officers. This includes arranging for inspection visits of boiler inspector periodically as per BHEL Engineer's instructions, submitting documents, radiographs, etc. and following up the matter with them.

3.16.2 All fees connected with the contractors for testing his welders / men / workers and testing, inspection, calibrating of his instruments and equipments, shall be paid by the contractor. It shall be his responsibility to obtain approval of statutory authorities, wherever applicable, for the conducting of any work which comes under the purview of these authorities. Any cost arising from this shall the contractor's Account. However, BHEL shall pay all other fees (FEES FOR VISITS, INSPECTION FEES, REGISTRATION FEES, ETC.) In case these inspections have to be repeated due to default / fault of the contractor and fees have to be paid again, the contractor shall have to bear the charges. These would be deducted from his bills.

HSE SPECIFIC REQUIREMENT

OCCUPATIONAL HEALTH & SAFETY MANAGEMENT SYSTEM

SUB CONTRACTOR TO ENSURE COMPLIANCE OF THE FOLLOWING HEALTH RELATED POINTS

01. Sub-contractor to identify nearest hospital for Health check up of his staff and workers and intimate BHEL site office & PSSR HQ.

02. To arrange for occupational health check up / screening of contractor's staff and workers engaged in sub contracting activities. In this, category of workmen such as welders, gas cutters, grinders, radiographers, crane operators are to be given exclusive attention in respect of health screening.

03. Sub-contractor to arrange an ambulance vehicle or emergency vehicle on a continuous basis to meet any emergency situation arising at site work in which his staff and workers are engaged.

04. To provide appropriate facilities for prompt first aid treatment of injuries and illness at work. One first Aider for each sub contractor to be provided. First Aider should undergo training on first aid.

05. To provide filtered drinking water at selected place in a clean container.

SUBCONTRACTOR TO ENSURE COMPLIANCE OF THE FOLLOWING SAFETY RELATED POINTS

01. Personnel protective equipment (PPES): Required number of following PPES (Confirming to Relevant is Standards) to be made available to workmen at site and ensured that they are used .

- Helmet
- Safety goggles
- Welding face shields
- Safety belts for working at heights
- Safety shoes
- Ear plugs

- Rubber gloves and mats for low tension (I.T) electrical works
- Gum boots & aprons
- Other items as required by BHEL site

02. Sub contractor to liaise with nearest fire station and inform contact telephone number and contact person to meet any emergency.

03. To provide appropriate fire fighting equipment at designated work place and to provide fire fighting training to selected persons in his group of workmen to meet emergencies.

04. To provide adequate number of 24 V power supply points to work in a constrained and enclosed space.

05 . All power tapping points / switch boards /power & control cabling should fulfill required electrical safety aspects as per relevant is standard.

06. ELCH's (Earth leak circuit breakers) at all electrical distribution points to be provided.

07. Red and white caution tape of proper width (1.5 to 2 inch) to be used for cordoning unsafe area such as open trench, excavated area, etc.

08. To provide sub-contractors company logo or clothing to all staff and workers for identification including identity cards with photographs approved by BHEL.

09. High pressure and structural welders to be identified with colour clothing and to display copy of welders certificate with photographs of welder at the work place. They also should be in possession of valid welding procedure.

10. To display safe handling procedure for all chemicals such as lube oil, grease, sealing compound, kerosene, diesel etc. At stores & respective work place.

11. Contractor should authorize a person at site to stop work if there is a unsafe work noticed as per his knowledge.

12. Fitness for use of erected scaffolding to be certified by the contractors approved scaffolder and the certificate should be

displayed on the scaffolding itself. If the scaffolding is unsafe, the same will not be used. the certificate to be updated daily. The scaffolding to be made as per the relevant is standard.

13. For making platform on the scaffolding , proper thickness and size of the plank of required quality wood to be used. The safe working load of the platform to be displayed on the scaffolding itself. Proper use of platform to be explained to the user.

14. All plant equipment should have inspection report before put in to use.

15. All T&Ps should be of reputed brand and having quality certificates.

16. All IMTEs should have valid calibration certificate from recommended institution / testing lab and these should be in place.

17. All lifting tackle and plant equipment should have safe working load certificate.

18. The right worker should be deployed for right job and the resume of site in charge, supervisors, and key workers to be submitted before commencement of work..

19. Sub-contractor should submit inspection / testing matrix of all T&Ps and to be approved by BHEL.

20. Sub-contractor to display safety slogan, safety board, caution boards wherever required in consultation with BHEL.

21. Sub-contractor to provide gas detectors of reputed make at desired locations.

22. Sub-contractor to conduct emergency mock drills. one drill per 6 month and submit report to BHEL.

23. Safe handling and storing of all equipment with adequate space to be ensured.

24. Sub contractor to deploy safety supervisor till the completion of the project.

25. Sub contractor to comply the safety reporting procedure of BHEL as practiced at present and also additional requirements that may arise out of future improvements in the safety management system. This includes computation of safety indices such as frequency rate, severity rate & incident rate.

26. Sub contractor to identify probable emergency situations such as electric shocks to workmen , caving in of shored earth , fall from height, collapse of scaffolding fire etc., and should have clear action plan to overcome them. Sub contractor to take required guidance from BHEL in this regard.

27. Sub contractor to identify hazardous activities which he may carryout and should train his workmen in those activities with the relevant operation control procedures. Sub contractor to take required guidance from BHEL in this regard.

28. Safe work permit system to be followed while working in confined space / near electric systems.

SUBCONTRACTOR TO ENSURE COMPLIANCE OF THE FOLLOWING ENVIRONMENT RELATED POINTS

1. HOUSE KEEPING : Sub contractor to carry out daily house keeping of work areas / stores through a check list prepared in consultation with BHEL.

2. Sub contractor shall adopt pollution prevention / reduce /control approach in all his site activities. this shall include:

    a. Transporting of oil / chemicals from stores to site safely without causing spillage. in case of any spillage, the area shall be cleaned and the remnant spilled oil disposed off to a safe place, identified for such disposal.

    b. To use required containers / cans / safety gadgets /appliances for transporting and for usage of oil / chemicals at site.

3. Sub contractor shall arrange for segregation / collection of scraps and dispose off to the identified place meant for scrap collection.

4. Sub contractor to adopt good erection practices / procedures with the objective of reduction of waste generation / rework

OTHER HSE REQUIREMENTS TO BE COMPLIED BY SUB CONTRACTOR

1. Sub contractor to clearly understand and accept the HSE policy of PSSR with a commitment to comply the requirements of the policy.

2. Sub contractors to arrange for daily meeting of their supervisors and work force before they disperse for their daily planned activities where in the relevant health , safety and environment aspects of the job and use of PPES are explained

3. Sub contractor to conduct monthly HSE meeting (internal) and submit the report to BHEL.

4. HSE slogans to be displayed in a proper board – hoarding at designated places in consultation with BHEL.

5. Sub contractor to submit a structured programme for training & occupational Health Screening of their work force at site after the Award of LOI.

IMPORTANT NOTE

Bidders are requested to furnish the Informations as required in appendices of Section IV & V of this booklet

Attach separate sheet if necessary

Bids with incomplete particulars Will be summarily Rejected

General Conditions of Contract
SECTION IV

APPENDIX –I

FINANCIAL VIABILITY

1.	Owner's capital in the business (in case of Partnership please mention percentage shares and amounts)	Rs.	
2.	Quantum of business done during	1.	Rs.
	Last three financial years (only in	2.	Rs.
	Construction of Power Plants)	3.	Rs.
3.	Value of fixed assets of the	1.	Rs.
	Business in last three years	2.	Rs.
		3.	Rs.
4.	Guarantee limits (if any enjoyed by the firm)		
5.	Overdraft limits (if any enjoyed by the firm)		
6.	Income Tax paid during the last	1.	Rs.
	Three years	2.	Rs.
		3.	Rs.
.	Please state whether Audited profit & Loss Account and Balance Sheet for the last 3 Years are enclosed	YES/	No

Signature of the Tenderer

Note: All the documents should be duly certified by auditor/Bank as may be applicable.

APPENDIX – II

SECTION IV

LIST OF QUALIFIED MANPOWER AVAILABLE

(A) List of Qualified Manpower available with the Tenderer:

Sl.No.	Name	Qualification	No. of years of Experience (ref.note 2)

(B) List of Qualified Manpower to be deployed exclusively for this Contract:

Sl.No.	Name	Qualification	No.of years of Experience(ref.note 2)

Signature of the Tenderer

Note:

1.The Manpower indicated against paragraph(B) above shall be further augmented with additional category/number of Tools and plants as and when required and as directed by the Engineer in charge to complete work as per the time of completion accepted.

2. The experience may be indicated fieldwise (Attach separate sheets if necessary)

APPENDIX – III

SECTION IV

DETAILS REGARDING SIMILAR JOBS EXECUTED/IN PROGRESS

Sl.No	Details of jobs Executed/in Progress with Location of Project/site In the last 5 years	Financial value of the contract	No. of skilled/ unskilled Workers deployed at the project/ site for the job	No. of staff, deployed at the project site for execution of the job	Remarks
1	2	3	4	5	6

Signature of the Tenderer

APPENDIX –IV

SECTION IV

ANALYSIS OF UNIT RATE QUOTED

S.No.	Description	Percentage of the unit rate quoted	Remarks, if any. Ref. Note 2
1.	Site facilities Viz. Electricity, water , workshop and other infrastructure facilities.		
2.	Salary & Wages for staff and workers		
3.	Consumables a) Gases b) Electrodes c) Steel materials d) Others		
4.	Depreciation & Maintenance for T&P and other items		
5.	Establishment & Admn. Expenses of site		
6.	Retrenchment benefit		
7.	Overheads		
8.	Profit		
9.	Extra work incidental to Erection		

Note:

1. All tenderers are requested to note, the rates quoted by them are not disclosed in any way while furnishing the above details.
2. Bidders are requested to indicate the type of accommodation he is planning to provide for staff & workers and the details of medical, conveyance and other amenities he is planning to provide for staff & workers in a separate sheet.

Signature of the Tenderer

APPENDIX – V

SECTION IV

DECLARATION SHEET

The Bidders are requested to furnish the following information while quoting, failing which their offer will be summarily rejected.

1.	Whether any relative(s) is presently employed in BHEL? If so, his connection with the Firm	**:** YES/ NO (If yes, please give particulars)
2.	Whether any ex-BHEL employee Is associated /working with the Firm?	**:** YES/NO (If Yes, please give particulars)
3.	Whether any BHEL employee is Holding any share in Firm?	**:** YES/NO (If yes, please give particulars)

Signature of the Tenderer

Note:

1. Attach separate sheet, if necessary.

2. If the BHEL Management comes to know, at a later date, that the information furnished by the Bidder is false, suitable action will be taken according to law against the contractor.

General Conditions of Contract
SECTION V
CONTRACTOR'S SAFETY PLAN

The Bidder should submit a suitable safety plan along with their offer. The safety plan shall indicate in detail the measures that would be taken by the contractor to ensure the work safely. Submission of a written safety plan by the bidder along with their offer is expected to make them clearly understand their responsibility towards safety plan by the parties before they assist BHEL Engineers in enforcing safety measures.

The Safety Plan aims at the contract's.

- Engaging qualified full time safety personnel at site particularly when the total manpower deployed is more than 500.
- Organising suitable motivation/educational programme for all workers in their control.
- Deploying T&Ps of acceptable quality only
- Towards this specific details/confirmations in respect of the following must be obtained among other things.
- Contractor's Safety Organisation with Name, Designation and qualification of full time engineer.
- Max. No. workmen likely to be employed with breakup, trade level of experience and qualifications wise.
- Motivation/training programme proposed for the workers.
- Personal protective equipment to be provided for workmen and system for ensuring usage.
- Confirmation regarding acceptance of fines for non-compliance of safety norms
- List of T&Ps proposed to be deployed with full particulars
- Fire Safety Measures proposed
- Records and reporting system
- Deviations from BHEL Safety conditions/Code of Safety norms.

A proforma for the safety plan is placed vide Annexure I.

ANNEXURE I

SAFETY PLAN

Name of Project

Description of Work

Tender No.W.O.No.

1.0 DETAILS OF PROPOSED WORK

1.1 Scope

1.2 Total tonnage to be erected (appx.)

1.3 Period of completion (months)

1.4 Max.No.of personnel to be
Deployed (Nos.)

2.0 SAFETY ORGANISATION

2.1 Furnish details of atleast 3 major
Jobs executed in the past

2.2 How many sites you are operating
Presently

2.3 Furnish details of safety
Organisation at HQ and project Sites

2.4 Furnish Name, Qualification and
Designation of Safety Engineer

2.5 Is he a full time safety engineer

2.6 If not furnish details of additional
Work assigned to him

2.7 Details of Personnel
Qualified in administering First Aid

2.8 Details of Personnel trained
In Fire Fighting operation

3.0 CONTRACTOR'S PERSONNEL

3.1 Furnish details of Max.

Manpower likely to be deployed :

a. Executive :

b. Supervisors :

c. Workers :

d. Others :

TOTAL :

3.2 Please indicate details of workmen based on experience in identical work

a. With more than 5 years experience :

b. Upto 5 years experience :

c. No.previous experience :

TOTAL :

3.3 Please indicate details of Workmen qualification wise :

a. Graduates :

b. I.T.I. :

c. Metric :

d. VIII Std :

e. Others :

TOTAL :

3.4 Please furnish trade-wise Breakup of workmen :

a. Fitter :

b. Welder :

c. Rigger :

d. Electrician :

e. Helpers :

f. Others :

TOTAL

:

4.0 SAFETY AWARENESS/ TRAINING PROGRAMME

4.1 Furnish details of safety programmes : Organised by you in the past

4.2 Safety oroganised programmer proposed : During the course of execution of the job

5.0 PERSONAL PROTECTIVE EQUIPMENT :

5.1 List down the 'PPE' provided to workmen :

APPLIANCES

a. Safety Helmet :

b. Safety belt :

c. Eye and Face protection device :

d. Hand and Body protection device :

e. Safety shoes :

f. Other :

6.0 FIRE SAFETY MEASURES :

6.1 Furnish No. of Personnel : Trained in fire fighting operation

6.2 Portable fire extinguishers to be provided :
a. Number :

b. Type/Make :

c. Location :

6.3 Fire resistant covers to be provided for : Coverage of materials

a. Number :

b. Type/Make :

c. Size :

7.0 TOOLS AND PLANTS

7.1 Furnish details as per proforma

Sl.No.	Equipment with Capacity	Year of Mfg.	Date of last Major overhaul	Remarks
1 2 3 4				

8.0 GENERAL

8.1 Furnish deviation/comments if any on : BHEL code of Safety management

8.2 Indicate Safety reporting system proposed

a. Monthly Safety reports :

b. Accident reports :

c. Others :

8.3 Indicate Safety records to be maintained :

a. Accidents Investigation records :

b. Safety appliance issue register :

c. T&P Repair & Maintenance Register :

d. Others

Signature of Tenderer

APPENDIX –I

SECTION V

List of Equipments/ machinery / T& P Owned by the Contractor & Proposed to be Deployed by the Contractor for this work

Note: The Tenderers are required to furnish the details as desired below with regard to the Equipments, machinery, Tools & Tackles, Consumables and Workshop facilities owned by them along with documentary proof for the same.

Sl No.	Name of the Equipment	Total Quantity Available with the Company	Quantity Proposed to be deployed for this job	Type capacity, Specifications	Year of Make	Date of purchase	Registration No.	Present Location of the equipment	Utility Factor	Remarks If any
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.

Signature of the Tenderer

APPENDIX -II

SECTION V

ANALYSIS OF SIMILAR JOBS EXECUTED /IN PROGRESS

Sl. No.	Details of jobs executed/in progress with location of projects	Fin.value of the contract	Extra claims received Nature Amount	No.of skilled/ unskilled workers deployed at site for this job	No.of staff deployed at site for execution of job, Engr/Supervisor	No.of strikes, work stoppages with duration & mandays lost during execution of job	Brief description of negotiations held & settlement reached	No.of accidents (fatal/minor/ major)	Amt.of compensa-tions paid for accident	Details of insurance provided for the workers for accident/ Death	Details of safety equipments provided for workers

Signatutre of the Tenderer

APPENDIX –III

SECTION V

ORGANISATION STRUCTURE

1. Management Structure of the firm
   Whether Public Limited/Private Limited / sole Proprietorship / Partnership.

2. Details of the Staff presently on permanent rolls of the Organisation.

A) ENGINEERING STAFF:

Sl. No.	Name and Designation	Qualification	Erection Experience and Specialisation	State if proposed to be deployed at site for this job	Remarks

Signature of the Tenderer

B) DETAILS OF TECHNICAL STAFF

Category	Total No on rolls	No. proposed to be deployed at site for this job
Supervisors / Foreman		
Storekeepers		
Crane Operators		
Compressor Operator		
Mill Wright Fitter		
Pipe Fitters		
Instrument Fitter		
General Fitter		
Electrician		
Sarang		
Rigger		
Carpenter		
Painter		
Tinsmith		
Sheet Metal Fabricator		
Pipe Fabricator		
Cable Jointer		
Heavy Vehicle Driver		
Light Vehicle Driver		
Mason		
Refractory Mason		
Semi-skilled Worker		
Unskilled Worker		
Helpers		

Signature of the Tenderer

C) WELDERS

Sl.No	Name	Specialisation (Tig/Alloy/ Arc/Carbon arc/structural	Period of Experience	Average No.of Joints per day	% age rejection	Whether holding IBR Certificate & Period of validity	State if proposed to be deployed at site for this job	Remarks if any
1.	Please indicate how you propose to ensure quality of work at site.							

Signature of the Tenderer

APPENDIX - IV
SECTION V

DETAILS OF MAJOR MILESTONES ACHIEVED

Sl.No.	Name of Project with capacity	Date of L.O.I (Telex/Fax/ Telegram)	Date of start of Erection	Date of Boxing up	Date of Oil Flushing	Date of Barring gear	Date of Steam Rolling	Date of Synchronisation	Remarks if any

(ATTACH SEPARATE SHEET)

Name of Project with Capacity	Date of L.O.I (Telex/Fax/ Telegram)	Date of start of Erection	Date of Drum lifting	Date of Hydraulic test	Date of Light up	Date of steam blowing	Date of Safety valve Floating	Remarks If any

(ATTACH SEPARATE SHEET)

Signature of the Tenderer

ANNEXURE 'A'

BANK GUARANTEE FOR SECURITY DEPOSIT (PROFORMA)

In consideration of the Bharat Heavy Electricals Limited, having its registered office at BHEL House, Siri Fort, New Dehi – 110 049 the concerned division being Power Sector - Southern Region, located at 474, Anna Salai, Nandanam, Chennai – 600 035. Tamil Nadu (hereinafter called BHEL) having agreed to exempt ……..…….....……..

(hereinafter called "the said contractor(s)" from the demand, under terms and conditions of agreement dated ……..made between BHEL and …….for …….(hereinafter called " the said Agreement) of security deposit for the due fulfillment by said contactors of the terms and condition contained in the said agreement, or production of bank guarantee for Rs…….....……

(Rupees ……..only).

We …….(hereinafter referred to as "the

(indicate the name of Bank)

Bank") at the request of Contractor(s) do hereby undertake to pay to BHEL an amount not exceeding Rs…… against any loss or damage caused to or suffered or would be caused to or suffered by BHEL, by reasons of any breach by the said contractor(s) of any of the terms or conditions contained in the said Agreement.

2. We ……..……. do hereby
(indicate the name of Bank)

undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from BHEL stating that the amount claimed is due by way of loss / damage caused to or would to or suffered by BHEL by reason of breach by the said contractor's of any of the terms and conditions contained in the said Agreement or by reason of the contractor's failure to perform the said Agreement. Any such demand made on the bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs……..

3. We ……undertake to pay to BHEL any money so
(indicate the name of the bank)

demanded not withstanding any dispute or disputes raised by contractor(s) / supplier(s) in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under these presents being absolute and unequivocal. The payment so made by under this bond shall be valid discharge of our liability for payment thereunder and the contractor(s) shall have no claim against us for making such payment.

4. We…….....……..further agree that the guarantee herein
(indicate of the name of Bank)

contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of BHEL under or by virtue of the said Agreement have been fully paid and its claim satisfied or discharged or till BHEL certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said

contractor(s) and accordingly discharge this guarantee, unless a demand or claim under this guarantee is made on us in writing on or before …….

We shall be discharged from all liability under this guarantee thereafter.

5. We…….further agree with BHEL, that BHEL shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder, to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said contractor(s) from time to time or to postpone any time, from time to time any of the powers exercisable by the BHEL against the said Contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reasons of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act, or commission on the part of BHEL or any indulgence BHEL to the said contractor or by any such matter or thing whatsoever which under the law relating to sureties would but for this provisions, have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s) / Supplier(s).

7. We …….....…….lastly undertake not to revoke

(indicate the name of bank)

this guarantee during its currency except with the previous consent of BHEL in writing.

8. The address of BHEL of services, correspondence in respect of matters relating to this guarantee shall be

BHARAT HEAVY ELECTRICAL LIMITED
POWER SECTOR, SOUTHERN REGION
474, ANNA SALAI, NANDANAM
CHENNAI – 600 035.

Address of the Bank in full

_____
_____
_____

Dated the ……day of ……20…..

Pincode :

Telegraphic Code : For ……..
(indicate the name of bank)

Telex No :

Fax No :

Witness :

ANNEXURE – 'B'

PROFORMA OF PERFORMANCE BANK GUARANTEE

1. This deed of guarantee made this ……day of ……..……20 by …….Bank Ltd……...……. ……in favour of Bharat Heavy Electricals Limited, Power Sector – Southern Region, 474, Anna Salai, Chennai – 600 035 having its Registered Office at BHEL House, Siri Fort, New Delhi – 110 049 (hereinafter called the principal)

2. Whereas Messrs ……(with full contractor's address) (hereinafter called the contractor) have entered into a contract (contract No…….dated……) for (name of work ……with the Principal (hereinafter called the said agreement).

3. AND WHEREAS the said contractor shall execute a performance bank guarantee for indemnifying the principal to the extent to ……... ……..and whereas the said Messrs……. have approached ……Bank Ltd. and at the request and in consideration of the arrangement arrived between the said Messrs……. ……and the said Bank as hereinafter mentioned to the aforesaid Principal.

4. Now, therefore these present witness that we ……. Bank Ltd. by the hand of Shri …….its, lawfully and duly constituted attorney, do hereby undertake to pay without demur to the aforesaid company a sum of Rs…….(Rupees……...……. ……only) on demand being made by the said Principal and to keep the said Principal indemnified by virtue of this guarantee against any loss or damage caused to or suffered by the said Principal by reason of any parts that may develop defects, fails or show signs of failure in the equipment arising from faulty workmanship thereby impairing the serviceableness under the proper use as per instructions provided by the contractor for a period of 12 months from the date of receipt of payment and also for breach of the terms and conditions of contract. We therefore undertake to pay the said amount in a lump sum on demand or such part thereof as the Principal may demand from time to time, irrespective of the fact whether the said contractor admits or denies in any Court, Tribunal or Arbitration proceedings or before any authority.

5. The aforesaid Guarantee will remain in force and we shall be liable under the same irrespective of any concession of time granted by the said company to Messrs ……..…….....……in or fulfilling the said contract between Messrs…….. and the principal and the guarantee will remain in force irrespective of any change of terms, conditions or stipulations or any variation in the terms of the said agreement irrespective of whether notice of such change and /or variation, is given to us or not and claim to receive such notice of any change and / or variation if the terms and/or conditions to said agreement is hereby specifically waived by us. Further, we shall not be released from this guarantee by any forbearance, or the exercise or non-exercise of any of the power of rights under the said Agreement by the said Principal against the Messrs…….. irrespective of whether notice of such forbearance or enforcement or non-enforcement of any powers or rights, modification or changes made in the said agreement or concession shown to Messrs……by the Principal is given to us or not.

6. The guarantee herein contained shall not be determined or affected by the liquidation or winding up or insolvency or changes in the composition of firm/company of the said Messrs…….....……and shall in all respects and for all purposes be binding and operative until the payment of all moneys due or that may hereinafter become due to the said Principal is made to the Principal irrespective of any liability or obligations of the said Agreement.

7. We, the said Bank, further agree that the guarantee herein contained shall remain in force and effect during the period that would be taken for the performance of the aforesaid agreement and that it shall continue to be enforceable till all the dues of the Principal under or by virtue of the said agreement have been fully paid and its claim satisfied and discharged or till the Principal certified that the terms and conditions of the said agreement have been fully and properly carried out by the said Messrs…….and accordingly discharge the guarantee subject however that the Principal shall have the right under this guarantee after the expiry of ……from the date of its execution. Any claim, or dispute arising under the terms of this documents shall only be enforced or settled in the Courts at Chennai only.

8. The Bank hereby declares that it has power to issue this Guarantee under the Bank's Memorandum and Articles of Association and the undersigned has full power to do so under the Power of Attorney dated ……..
granted by proper authorities of the Bank.

9. The guarantee is valid up to ……...…....…… and unless a demand is made under this guarantee within six months from ……....……..all the rights of the Principal under the guarantee shall be forfeited and we the …….. Bank shall be released and discharged from all liability thereunder.

DATED THE

Bank by its constituted Attorney

(Signature of the person duly authorized to sign on behalf of the Bank)

Bank Address in full.

ANNEXURE – 'C'

(To be stamped in accordance with Stamp Act)
(BANK GUARANTEE FOR SECURING ADVANCE)
(Delete the words not applicable)

This Deed of Guarantee made this ……..……. day of ……between …….....…….. ……..(Bank) hereinafter called " the Guarantor" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns) of the ONE PART and M/s. Bharat Heavy Electricals Limited (A Government of India Undertaking) a Company incorporated under the Companies Act 1956, having its Registered Office at 'BHEL HOUSE' Siri Fort, New Delhi – 110 049 through this Unit / Division at 474, Anna Salai, Nandanam, P.O. Chennai - 600 035. hereinafter called "The Company" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors) of the OTHER PART:

WHEREAS M/s……....…… (herein after called the Supplier / Contractor) has entered into a contract No…… ……dated…….....…… (hereinafter called "the Contract") with the company for ……..…… ……..…… AND WHEREAS the Contract inter alia provides that the Company will pay to the contractor /Supplier advance of Rs……..……..(Rupees…….. …….only) on certain terms and conditions specified therein subject to the contractor furnishing a bank guarantee for Rs…….(Rupees …….....…… …….only) in favour of the company.

AND WHEREAS the Contractor/Supplier has approached the Guarantor and in consideration of the arrangement arrived at between the Contractor / Supplier and the Guarantor, the Guarantor has agreed to give Guarantee as hereinafter mentioned in favour of the Company.

NOW THIS DEED WITNESSES AS FOLLOWS

1. In consideration of the Company having agreed to advance a sum of Rs…….(Rupees…….. only) to the Contractor/Supplier, the Guarantor do hereby guarantee the due recovery by the Company of the said advance with interest thereon as provided according to the terms and conditions of the Contract. If the said contractor/ Supplier fails to utilize the said advance for the purpose of the contract and/or the said advance together with interest thereon as aforesaid is not fully recovered by the Company, the Guarantor do hereby unconditionally and irrevocably undertake to pay to the Company without demur and merely on a demand to the extent of the said sum of Rs……...…….. (Rupees…….....……..only).
   Any claim made by the company for the loss or damage caused to or suffered by the Company by reason of the Company not being able to recover in full the said sum of Rs……with/without interest as aforesaid.

2. The decision of the Company whether the contractor/supplier has failed to utilize the said advance or any part thereof for the purpose of the contract and or as to the extent of loss or damage caused to suffered by the company by reason of the Company not being able to recover in full the sum of Rs……..with/without interest shall be final and binding on the Guarantor, irrespective of the fact whether the Contractor/Supplier admits or denies the default or questions the Correctness of any demand made by the Company in any court, Tribunal or Arbitration Proceedings or before any other Authority.

3. The Company shall have the fullest liberty without affecting in any way the liability of the Guarantor under this Guarantee, from time to time to vary any of the terms and conditions of the Contract or the advance or to extend time of performance by the Contractor/ Supplier or to postpone for any time and from time to time any of the powers exercisable by it against the said contractor/supplier and either to enforce or forbear from enforcing any of the terms and conditions governing the said contract the advance or securities available to the Company and the Guarantor shall not be released from its liability under these presents by any exercise by the Company of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor /Supplier or any other forbearance act or omission on the part of the Company or any indulgence by the company to the said contractor/ supplier or of the other matter or thing whatsoever which under the law relating to sureties, would but for this provision have the effect of so releasing the Guarantor from its liability under this Guarantee.

4. The guarantee further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the contract and till the said advance with/without interest has been fully recovered and its claims satisfied or discharged and till…….. certifies that the said advance with interest has been fully recovered from the said contractor/supplier and accordingly discharges this Guarantee subject, however, that the company shall have no claim under the Guarantee after …….years from the date of completion of the contract, as the case may be unless a notice of the claim under this Guarantee has been served on the Guarantor before the expiry of the said period in which case the same shall be enforceable against the Guarantor not withstanding the fact that the same is enforced after the expiry of the said period.

5. The Guarantor undertake not to revoke this Guarantee during the period it is in force except with the previous consent of the Company in writing and agree that any liquidation or winding up or insolvency or any change in the constitution of the Contractor /Supplier or the Guarantor shall not discharge the Guarantor's liability hereunder.

6. It shall not be necessary for the Company to proceed against the Contractor before proceeding against the Guarantor and the Guarantee herein contained shall be enforceable against them notwithstanding any security, which the company may have obtained or obtain from the Contractor/Supplier shall, at the time when proceedings are taken against the guarantor hereunder be outstanding or unrealized.

7. The Guarantor hereby declares that it has power to execute this guarantee under its Memorandum and Articles of Association and the executant has full powers to do so on its behalf under the power of Attorney dated ……. granted to him by the proper authorities of the Guarantor.

8. "We …….undertake to pay to BHEL any money
(indicate the name of Bank)

so demanded not withstanding any dispute or disputes raised by contractor(s) supplier(s) in any suit or proceedings pending before any court or Tribunal relating thereto our liability under these presents being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder and the contractor(s)/Supplier(s) shall have no claim against us for making such payment".

IN WITNESS whereof the ……..……..(Bank) and M/s. Bharat Heavy Electricals Limited, have hereunto set and subscribed their respective hands the day, month and year first above written.

WITNESSES :

1.

2.

Signed for and on behalf
of the (Bank)

WITNESSES :

1.

2.

Signed for and on behalf of
Bharat Heavy Electricals Limited

ANNEXURE –'D'

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
Power Sector – Southern Region, Chennai –600 035.

CONTRACT AGREEMENT

AGREEMENT NO: BHEL:PS:SR:SCT: DATE:

Name of work

Name of the Contractor with full Address :

Amount of Tender Accepted :

Letter of Intent No :

Time allotted for completing the work :

(Date of completion) :

Contractor
(To be Signed by a Person holding Valid Power of Attorney)

(Officer authorized to sign the agreement)

CONTRACT AGREEMENT

AGREEMENT NO: BHEL:PS:SR:SCT **DATE :**

This agreement made this day, the ……...…….between the Bharat Heavy Electricals Limited, Power Sector, Chennai – 600 035 having its Registered Office at BHEL House, Siri Fort, New Delhi-110 049 (hereinafter called the FIRST PARTY) of one part and M/s. ..... (hereinafter called the "CONTRACTOR) of the SECOND PART.

2. WHEREAS the first party is desirous of executing the work of ……..…….. …….more particularly described in the appendices including drawings and specifications attached herewith:

3. WHEREAS IN PURSUANCE of the said Contractor's Tender having been accepted, the first party has decided to give the above said work to the Contractor.

4. WHEREAS the said Contractor has agreed to do the aforesaid work of the first party subject to the conditions herein contained in these presents, instructions to tenderers, general conditions and special conditions, schedules, appendices, Letter of intent and specifications (hereinafter referred as the said Contract schedule) at the approved rates (hereinafter referred as the said Contract rate)

5. AND WHEREAS the said Contractor has furnished a Bank Guarantee for a sum of Rs…….(Rupees…….....……..) bearing no …….dt…….from ……Bank …….....……..valid upto …….....…….towards initial 50% Security Deposit and has further agreed for balance 50% Security Deposit being recovered at 10% of value each running bill till the full Security Deposit is made up for the satisfactory completion and performance of the work and whereas the validity of the said Guarantee has to be extended by the Contractor, if so required before …….. ……..for the balance of contract period and in the event of his failure to do so the contractor shall pay or accept recovery of this amount of Rs……..…….(Rupees……only) from the bills forthwith in one instalment and it has further been agreed that the failure to extend the validity of Bank Guarantee or failure to pay the aforesaid amount in the manner specified above shall constitute the breach of contract, and first party reserves the right to take any legal action deemed fit for recovering the said sum of Rs……..(Rupees…….....……..)

This amount of Rs…… (Rupees…….....……) will be refunded and the Bank Guarantee will be returned to the Contractor on satisfactory completion of the work as specified in the Contract documents.

6. NOW THESE PRESENTS WITNESS that in consideration of the said contract schedule and said Contract rate, as also of agreement of good and faithful service to be rendered and performed by the Contractor in the execution of the said work, subject to the stipulation hereinafter expressed.

7. That the said Contractor will perform the aforesaid work subject to the conditions contained in these presents, instructions to tenderers, general and special conditions of contract and contract documents attached herewith including the said schedules, specifications, Letter of Intent, drawings attached and also such other drawings and instructions as may from time to time be given by the first party. And that the said contractor shall be deemed to have carefully examined the specifications and conditions of contract, appendices, schedules, Letter of Intent, drawings, etc as aforesaid and also to have satisfied himself as to the nature and character of the work to be executed.

8. That the said Contractor shall carry out and complete the executions of the said work to the entire satisfaction of the engineer within the agreed time schedule.

9. That the first Party after proper scrutiny of the bills submitted by the said contractor will pay him during progress of the said work, at said contract and agreed terms of payment, a sum as determined by the first party in respect of the work executed by the Contractor.

10. That the contract shall come into force with retrospective effect from the date on which letter accepting the tender (Letter of Intent) has been issued to the said contractor.

11. That whenever under this contract or otherwise, any sum of money shall be recoverable from or payable by the contractor, the same may be deducted in the manner as set out in the conditions of contract as aforesaid.

12. That all charges on account of Octroi, terminal and Sales – Tax or other duties on material obtained for the works shall be borne by the said contractor.

13. That is agreed between the parties that the non-exercise of any powers conferred on the authorities of the first party will not in any manner constitute waiver of the conditions hereto contained in these presents and the liability of the said Contractor either of past or future compensation shall remain unaffected.

14. That the expression BHEL wherever occurring means the BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR – SOUTHERN REGION, CHENNAI – 600 035.

15. The documents hereto attached viz.,

shall also form part of this agreement.

16. In witness hereof the parties have respectively set their signature in the presence of :

WITNESSES:
(With full address)

1.

2.

Date :

Signature of the Contractor
(To be signed by a person
holding valid power of Attorney
of the company)

WITNESSES:

For and on behalf of the
BHARAT HEVY ELECTRICALS LTD.

1.

2.

SECTION VI

SIPAT 2X 500 MW (UNIT IV & V)

HT / LT ELECTRICAL PACKAGE

SCOPE OF WORK AND SPECIAL CONDITIONS

6.0.0 GENERAL

The scope of work shall comprise but not limited to the following:

Identification of equipment at storage yard, technical assistance for checking and making the shortage/damage reports, taking delivery at storage yard and pre-assembly of equipment wherever required, erecting, checking, carrying out statutory tests as required, pre-commissioning, commissioning & post-commissioning activities and maintenance up to the time of efficient highly reliable commercial & trail operation of the unit and handing over to customer or till completion contract period which ever is earlier, along with the supply of Electrical Hardware as per BOQ and all consumables, tools & tackles and testing instruments. The installation and commissioning of all the electrical equipments/items shall conform to the technical requirements specified in separate sections of the tender.

6.0.1 The performance of the Contractor's works under the Contract shall be in accordance with good engineering and construction practices, notwithstanding the fact that every item involved may not be specifically mentioned but necessary to complete the system shall be deemed to have been included in the scope of the work to meet the Main plant requirement.

6.0.2 Site testing wherever required shall be carried out for all items installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations.

6.0.3 The contractor shall take full responsibility for satisfactory testing, pre-commissioning, commissioning and trial run of the connected equipment under overall guidance of BHEL and shall locate any cause of malfunction and rectify the same for proper operation. Testing shall also include any additional tests, which the Engineer feels necessary for site conditions and also to meet system specification.

6.0.4 The work shall be executed under the usual conditions without affecting power plant construction and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

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

6.0.6 Contractor shall erect all items/materials etc. as per sequence prescribed by BHEL at site. BHEL engineer depending upon the availability of materials/work fronts etc shall decide the sequence of erection/commissioning methodology. No claims for extra payment from the contractor shall be entertained on the grounds of deviation from the methods of erection/commissioning adopted in erection/commissioning of similar job or for any reasons whatsoever.

6.0.7 All necessary certificates and licenses required to carryout this work are to be arranged by the contractor expeditiously at his cost.

6.0.8 During the course of erection, testing and commissioning of electrical work, certain rework / modification / rectification / repairs / fabrication etc. may be necessary on account of feed back from other power stations or units already commissioned and / or units under erection and commissioned and also on account of design changes and manufacturing incompatibilities and site operation / maintenance requirements. Contractor shall carryout such rework / modification / rectification / fabrication / repairs etc, promptly and expeditiously.

6.0.9 The contractor shall take delivery of item, materials, from the storage yard / stores / sheds of BHEL / customer which is within a radius of 5 kms. He shall also make arrangements for safe custody, watch and ward of equipment after it has been handed over to him till they are fully erected, tested and commissioned. The contractor shall note that items/materials shall be transported to erection site / assembly yard etc. by the prescribed route without disturbing and causing damage to other works in the most professional manner. Items, Hardware, etc. shall be stored in appropriate manner as per BHEL's instructions.

6.0.10 The contractor shall take delivery of items/materials, and consumables from the stores/ storage area / sheds of BHEL / customer after getting approval of engineer / customer in the prescribed indent forms of BHEL / customer.

6.0.11 After completing all the works, contractor shall hand over all remaining extra materials with proper identification tags in a packed condition to BHEL stores. In case of any use over actual design requirements, BHEL reserves the right to recover the cost of material used in excess or misused. Decision of BHEL engineer in this regard shall be final and binding on the contractor.

6.0.12 Contractor shall, transport all materials to site and unload at site / working area, or pre-assembly yard for inspection and checking. All material handling equipment required shall be arranged by the contractor.

6.0.13 Contractor shall retain all T&P/Testing instrument/Material handling equipments etc at site as per advice of BHEL engineer and same shall be taken out from site only after getting the clearances from engineer in charge.

6.0.14 Contractor shall remove all scrap materials periodically generated from his working area in and around power station and collect the same at one place earmarked for the same. Load of scraps is to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect. All the package materials, including special transporting frames, etc. shall be returned to the BHEL stores / customer's stores by the contractor.

6.0.15 The contractor at his cost shall arrange necessary security measures for adequate protection of his machinery, equipment, tools, materials etc. BHEL shall not be responsible for any loss or damage to the contractor’s construction equipment and materials. The contractor may consult the Engineer-in-Charge on the arrangements made for general site security for protection of his machinery equipment tools etc.

6.0.16 The contractor shall ensure that his premises are always kept clean and tidy to the extent possible. Any untidiness noted on the part of the contractor shall be brought to the attention of the contractor’s site representative who shall take immediate action to clean the surroundings to the satisfaction of the Engineer-in-Charge

6.0.17 The Contractor may have to execute work in such a place and condition where other agencies also shall be under such circumstances. However completion time for erection agreed shall be subject to the condition that contractor’s work is not hampered by the agencies.

6.0.18 Scope of work covered under this specification requires quality workmanship, engineering and construction management. The contractor shall ensure timely completion of work. The contractor shall have adequate tools, measuring instruments, calibrating equipment etc. in his possession. He shall also have adequate trained, qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works. The contractor shall have valid **ELECTRICAL CONTRACTOR LICENSE** to carry out the scope/job mentioned in the BOM.

6.0.19 All the surplus, damaged, unused materials, package materials, containers, special transporting frames, gunny bags etc. shall be returned to the BHEL stores / customer's stores by the contractor.

6.0.20 Any wrong erection shall be removed and re-erected promptly to comply with the design requirements to the satisfaction of Site Engineer.

6.0.21 If any item or equipment not covered but requires being erected/commissioned, the same shall be carried out by the contractor. Equivalent unit rate for those item or equipment shall be considered wherever possible from the BOQ. The rates quoted by the contractor shall be uniform as far as possible for similar items appearing in rate schedule.

Note:

1. **Bill of Materials (BOM) contains detailed specification of various items, system wise and BHEL Unit –wise. Scope of work specific for each item is indicated in the BOM. In addition to these clauses, the other common clauses like painting, calibration, civil work etc. related to the work are also to be referred.**
2. **The Rate Schedule contains the consolidated list of BOM with brief description of items.**
3. **Rates are to be filled only in the Rate Schedule.**
4. **Before filling the Rates in the Rate schedule, the bidder shall go through the detailed specification of all items of BOM as well as Scope of Work as specified in relevant Clause of this document.**
5. **Section VII contains General Guidelines for Erection and Commissioning of Electrical systems.**

6.1.0 SOMS (Site Operations Management System) –An Over View

6.1.1.1 SOMS is an Online WEB based system covering all aspects of site operations from estimation to contract closing.

The modules include:

1. Documentation management System
2. Materials Management System
3. Tools & Plants (T&P), IMTE System
4. Erection / Material Handling and billing System.
5. Performance Monitoring of Contractors, Welders and total no. Of joints
6. Site Deviation / Failure Monitoring System, SARs, CARs.
7. Management Information Report System (MIRS)
8. Customer billing
9. Sub Contractor Billing
10. Integration of Contractor bill payments, Recoveries from Contractor, T&P Hire Charges with existing Financial System already running in BHEL.
11. Local purchase material accounting system.
12. Insurance claim management

6.1.1.2 OBJECTIVE

- WEB based system for all site related activities to effectively carry out, monitor and analyze activities on line for different sites.
- Lowering inventory cost, timely completion of planned activities and transfer of information without delay.
- Allow monitoring the project effectively.
- Interface with Online Finance System and aid activity based costing.
- Tool for effective Project Monitoring at HQ.
- Cover all site activities presently being done manually

- Create a database for future use
- Eliminate paper based reports
- Provide access to all users on need to know basis. This covers BHEL employees, Customers, Vendors etc.

The broad overview and objectives of SOMS is indicated above, however the tenderer is responsible and execute functions relevant to his scope of work enumerated in the specification.

6.1.4.3 ENVIRONMENT,The system works with following environment:

SERVER:Operating system – Linux 7.x ,Oracle database - 9.i
Oracle application server – 9.ias

Contractor shall provide the following exclusive computer system for SOMS with qualified operator.

S.No.	Features	Minimum Requirements
1	Processor	Intel Pentium 4 2 GHz or above
2	Chipset	Intel 845 or higher Intel Chipset
3	RAM	256 MB DDR SDRAM
4	HDD	40 GB
5	FDD	1.44 MB
6	Optical Drive	48x or above CDD
7	Monitor	15" VGA Colour
8	Keyboard	Minimum 104 keys Windows keyboard
9	Mouse	2 Button Scroll mouse
10	Ethernet	Integrated 10/100 Mbps NIC for LAN
11	Ports	Minimum 1 Parallel, 1 Serial, 2 USB
12	Software	Windows 2000 or XP Professional
13	Accessories	Mousepad & Dustcovers
14	UPS	1 kVA UPS with 1 hr. backup
15	Printer	A4 size Laser Printer - 20 ppm or above (with all consumables, cartridges & stationery)

6.2.0 SCOPE OF WORK IN GENERAL

6.2.1 The scope of Electrical Installation and Commissioning works covers mainly the Electrical Works related to Units IV & V (2 x 500 MW) including VFD, Auxiliary Boiler and Hydrogen Generation Building.

6.2.2 The scope of Electrical works are as detailed below:

1. Erection commissioning of various type of LT MCC /PCC, Rectifiers and other control panels.
2. Fabrication and Installation of Flexible cable tray supports for cable trays.
3. Installation of various types of trays with accessories.
4. Installation of above ground earthing grid, equipment earthing of all equipment, cable racks, trays etc.
5. Installation of lightning protection.
6. Installation of push button stations for local starting of all motors, Junction Boxes etc.
7. Commissioning of Generator, HT/ LT drives, ESP Transformer equipment erected by Mechanical contractor. (except Motor Operated Valves and Skid Mounted Drives)
8. Laying and termination LT-Power, control and Instrumentation cables
9. Supply and painting of all cable supports and other steel fabricated items
10. Erection and Testing Heating Elements and Thermostats
11. Erection and commission of Ash Level Instruments.
12. Erection and commissioning of VFD Electrical works, consisting of HT breakers, DC reactors, Transformers, Drive control panels, MMI and other control panels.

13. Erection and commissioning of Illumination of Hydrogen Generation Building.
14. Supply of all consumables required for installation as detailed elsewhere in the contract.
15. Installation of other items that have not been specifically indicated, but required for completing installation

6.2.3 **The scope of work in general covers identification of items at stores / yards, checking, reporting the damages if any, loading, transportation, unloading at Contractor's stores/ working yard, keeping in safe custody in contractor's stores, pre-assembly, calibration, checking, erection, testing and commissioning, supply of consumables like electrodes, gas, cable dressing materials, tag plates, ferrules, lugs (specific sizes), specific type of fasteners, paints and its consumables. Deployment of skilled / unskilled manpower, engineers / supervisors, T & P, Material handling equipments, Testing instruments (excepting proprietary type instruments), returning of un-used materials / items to BHEL stores.**

6.3.0 DETAILED SCOPE OF WORKS

6.3.1 HT AND LT SWITCHGEARS, POWER DISTRIBUTION BOARDS, AVR AND OTHER CONTROL PANELS.

1 **HT-SWITCHGEAR:**HT switchgears supplied shall be 3.3 KV. HT Switchgear shall be installed at VFD electrical rooms. The HT switchgears shall be of Type VM12 metal clad switchgear is of horizontal draw out pattern, suitable for easy extension of switchboard on both directions for systems up to 12 KV. The design incorporates single busbar system and a set of interlocks for safety of

operations and is fully compartmentalized. A panel consists of a fixed portion (and a moving portion) of modular construction having three high voltage chambers namely breaker chamber, bus bar chamber and CT chamber. Instrument panel is a separate low voltage chamber and shall be supplied with different type of protection relays, Instruments like Meters, Transducers, etc. Moving portion comprises of wheel mounted truck fitted with an operating mechanism, vacuum interrupters & isolating contacts. Generator relay and control panels shall be supplied with different type of protection relays, Instruments like Meters, Transducers, etc and these panels shall be mounted at unit control room.

Motor operated spring closing mechanism keeps the springs charged after every closing operation making it ready for next enclosure. Springs can also be charged manually in case of failure of auxiliary power to the spring charging motor.

AVR control panels shall be supplied with different type of protection relays, Instruments like Meters, Transducers, etc and these panels shall be mounted at unit control room.

2 **LT MCC :** LT MCCs are simple module type with isolators and fuses. However, some of the MCCs are Double Front draw out type consisting of circuit breakers unit, contactors/starter fuse switch units, MCB etc. arranged in multi-tier construction. These MCCs and AC DBs are mainly supplied to cater the requirement of drives, valves, etc. All the LT Switchgear, AC DB shall be located in ESP control room of Power House.

3 SCOPE OF HT/LT SWITCHBOARD, AC/DC DB

The base frames shall normally be supplied along with the boards. These shall be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not available, the same shall be fabricated, erected and painted at site. The material for this shall be supplied by BHEL. Base channels shall be grouted on the opening of the floor. All minor concrete chipping and finishing works are deemed to be included in the scope of the job. If base frame is to be fabricated/ erected, separate rate shall be paid on Tonnage basis. This is applicable for local start/stop push button box also. If any grouting bolts are required for the panel, the same shall be supplied at free of cost.

a. For the panels to be mounted on the trenches, channel supports have to be provided across the cable trenches over which the base frames of the panels shall be mounted. The contractor shall carry out fabrication and erection of these support structures and separate rate shall be paid on Tonnage basis.

b. The contractor shall set each section of equipment on its foundation or supporting structures and assemble the panels as required. Skilled manpower shall be engaged for installation of panels with parallel, horizontal and vertical alignment.

c. Panels will be delivered in different shipping sections. Necessary interconnection of busbar, inter panel wiring, etc. will have to be done by the contractor as part of panel erection.

d. Normally the panels shall be supplied with complete instrument mounting and wiring. However, if necessary, dismantling of the existing components, making minor modifications in the wiring to suit operating conditions, mounting and rewiring of new components shall be carried out without any extra cost. However, if any major wiring modification is involved inside the panel, the same shall be carried out at extra cost. Mounting and wiring of any instruments, meters, relays, push buttons, indicating lamps, contactors etc. if supplied loose for safety in transit, will also be included in the scope of the job.

e. The commissioning of Switchgear shall also involve the trial runs and commissioning of all connected equipment like servomotors and drives etc. The contractor will have to keep his people round the clock, if necessary during the trial runs and promptly take action for any repair, checks and rectification etc. required in the equipment erected by him. (Separate rate shall be paid for commissioning of associated electrical drives as per BOM).

f. The contractor shall carryout touch up painting for panels wherever required and this includes supply of paints also.

g. All T&P, Material handling equipment including cranes and Relay Testing/ HV Testing Calibration equipment/ Instruments shall be arranged by contractor.

h. The contractor shall calibrate and commission all switchgear/panel mounted instruments, protection relays, transducers, Recorders, Indicators, energy

meters etc with well-experienced Engineers/ Technicians.

i. MCC incomer bus shall be connected to PCC of customer. The contractor shall co-ordinate for proper connection at PCC.

j. Contractor shall co-ordinate with other cable-laying agency for proper cable termination.

k. All testing Instruments/ Equipment deployed to site shall be calibrated before putting the same into service. A copy of calibration certificate shall be submitted to BHEL Engineer for his verification and approval.

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

m. The contractor shall maintain the charged and commissioned equipment till the same is taken over by M/s NTPC.

n. If any removal/ Re-fixing of contactors/relays becomes necessary for the completion of the system, the same shall be done by the contractor at free of cost.

o. Any loose supplied items like lamps, lens, contactor, fuse/relays/instruments missed from the custody of the contractor shall be replaced by the contractor at free of cost.

p. Contractor shall put his watch and ward for the equipment under his custody and erected in location

against theft and damage by other agencies working on the same area.

q. Rubber mats for switchgear shall be supplied by BHEL, and these shall be laid, wherever required, by the contractor at free of cost.

r. The contractor shall close unused opening at the panel bottom plate with suitable material in consultation with Site Engineer at free of cost.

s. Scope of work shall also cover drilling of bottom gland plates for cable entry as required.

t. Contractor shall prepare all erection/ commissioning log sheets, protocols/test certificate s as per field quality plan, get it signed by the concerned BHEL/ NTPC Engineer and submit the same to BHEL Engineer as per his instruction.

u. Contractor shall close unused opening at the panel bottom plate with suitable material in consultation with Site Engineer at free of cost as part of panel erections

V. Dimensions & weights indicated in the BOQ against various panels are approximate only. There may be variations in the weight and dimensions. Variations in depth, height or weight of the panel shall not be considered for payment.

w. Any variation in length within ±20% shall not be considered for payment.

x. If the panels has any variation in length beyond ±20% as compared to actual length indicated in the BOQ,

payment shall be considered proportional to the length of the panel only.

4. SCOPE OF AVR AND OTHER CONTROL PANELS

a. The different types of Microprocessor based panels like PLC/DCS/IOS Panels, control panel etc. related to VFD and ESP are covered in the scope of work for erection and commissioning. The scope of work will be generally in line with Electrical MCC/PCC panels as detailed under clause. 6.3.1.3 These panels shall be installed in the respective control rooms.

b. Unit rate shall also include Testing, Calibration and adjustment of relays, electronic cards and instruments mounted on the panels.

c. If panels are supplied with monitor, printers, furniture, controller etc. or any loose items or equipments, the erection of above shall be part of respective panel. No separate rate shall be payable for loose supplied items.

d. Normally the panels shall be supplied with instruments / modules mounted and wired. No separate payment shall be made for commissioning of any instrument/ cards/ components. If dismantling of the above such instruments and rewiring are needed at site, the same shall be carried out at no extra cost. If any instruments/ cards/ components supplied as loose items for safe transit, the same shall be mounted and wired at no extra cost. However, if any major installation/modification/wiring are involved, the same may be carried out as extra work. The decision of BHEL engineer shall be final in respect of above extra works.

Note:- BHEL shall provide vendors supports for proprietary type of microprocessor based instruments, protection relays which requires software loading and programmer etc. However overall responsibility lies with contractor and the contractor shall provide all supports like manpower, standard T&P, Instruments etc for calibration and commissioning of above proprietary type instruments.

The contractor shall carry out testing and commissioning works with their own testing equipments and testing teams and should not engage outside agency for testing. Testing shall be done under the supervision of BHEL/NTPC Engineers.

6.3.2 **SCOPE OF TRANSFORMER:**

1. VFD Transformer

a. Receipt of all accessories & Spares including oil in drums from site store/yard, inspection, handling of accessories between stores & transformer yard / location up to respective plinth, storage, erection of all the accessories ,cabling from transformer accessories, to marshalling oil filling, Neutral formation, oil pressure testing dry out, pre-commissioning test, commissioning of equipment and final painting and handing over.

Note:- Refer Section VII for general technical requirements for erection, testing and commissioning.

b. VFD Transformer shall be dispatched to site mostly in assembled or semi assembled condition with partially oil filled or with out oil. Contractor shall arrange to assemble at site and carry out testing as mentioned above

c. Samples of each and every drum of Transformer oil shall be tested and pre-treated to achieve the desired value before filling in to the transformer tank. The entire arrangement for testing the oil sample, filtering whenever required to achieve the desired PPM, BDV within the shortest time shall be made by the contractor. The job has to be taken up in consultation with BHEL Engineers at site at the cost of the contractor. All the test equipment for testing specific gravity, PPM, BDV ,HV test shall also be arranged by the contractor

d. All the T&P, material handling equipment like cranes, Trailer, High vac filter machines of adequate capacity, 5 kV motorized megger and oil tank of suitable capacity etc, shall be arranged by the contractor at his cost. The transformers may have to be suitably lagged /covered during the drying out operation by the contractor at no extra cost...

e. **The contractor shall carry out testing and commissioning works with their own testing equipments and testing teams and should not engage outside agency for testing. Testing shall be done under the supervision of BHEL/NTPC Engineers.**

f. Test value of dielectric strength/PPM, specific gravity shall be as per recommended value of BHEL. If the test results are not satisfactory and if the customer desires to carry out the tests through some other agency, the same shall be carried out at contractor’s cost.

g. All the transformers protective system such as Buchholz relay explosion vent, oil and winding temperature detectors etc., healthiness are to be checked under the guidance of BHEL Engineer.

h. Transformer protective relays are to be checked prior to the commissioning of the transformer.

i. The scope of erection work shall also includes minor civil work such as chipping and grouting of the support structure as well as for the support of the transformer.

j. **Final painting shall be carried out for all the Transformers** The scope of final painting involves supply of paints, thinner and other consumables at the cost of the contractor as detailed in the painting clause. No separate rate shall be paid for painting. Calibration of testing equipment: All testing equipment (IMTE) shall be calibrated before putting into service at site. A copy of calibration certificate to be this effect shall be furnished to BHEL-Engineer for his verification and approval.

k. The contractor shall prepare all log sheets, test certificates, protocols etc. as per field quality plan, get it signed by concerned BHEL/NTPC Engineer and submit to the concerned BHEL Engineer

l. The contractor shall maintain the equipment erected and commissioned by him until taken over by NTP or up to the contract period**..**

m. **The contractor shall arrange suitable capacity of min 1000 litre/hour** filtering machines.

2. ESP Transformer.

All ESP transformers will be erected by the mechanical contractor. Testing and commissioning of ESP Transformer alone is covered in Electrical contractor’s scope. Scope of Testing and commissioning of ESP Transformers are follows.

a. Dry out of transformers (Oil filtration) till achieving desired BDV, IR Value,

b. Calibration of oil temperature gauges, Checking of breather gauge,

c. HV Test etc.

d. Replacing defective components like Temperature gauges, breather glass etc.

e. Attending to any defects till handing over of the unit to customer by BHEL

f. Other scope of works covered under clause 6.3.2 -VFD Transformer (Sl. No. e, f, g, h, k, l, m) are also applicable for ESP Transformer.

6.3.3 **SCOPE OF JUNCTION BOXES & PUSH BUTTON BOXES:**

1. The unit rate quoted for erection of junction boxes/push button boxes shall include providing necessary supports, drilling of bottom gland plates for cable glands as required, Painting the tag nos. of JB or fixing a separate tag plate as required on the junction boxes/push button boxes, supply of bolts ,nuts (Fasteners),for fixing of JB/PB, minor chipping, supply of grouting bolts and grouting as required for mounting of junction box/push button frames.
2. For fabrication and fixing of supports/Frame , rate shall be paid on tonnage basis.
3. The contractor shall close all unused holes on the gland plates using GROW MAT or any other suitable materials at free of cost.
4. All bolts and nuts (Fasteners) required for mounting the junction box shall be arranged by the contractor.

5. **If any intermediate JBs are required to terminate power cables for drives same shall be installed. Equivalent Unit rate shall be paid for installation of such JBs. Decision of site engineer will be final regarding the equivalent rate.**
6. **Any modification like replacement of terminals, enlarging gland holes etc. that required to accommodate power cables shall be carried out as part of this works.**

6.3.4 **SCOPE OF LAYING AND TERMINATION OF CABLES :**

1. Cable supplied shall be of LT, 1.1 KV, armoured/ unarmoured, Aluminium/ Copper PVC FRLS insulation, Power, Control and Instrumentation cables of different sizes.
2. Unit rate quoted for cable shall cover laying, termination, drilling of holes on the gland plates of the panels / JBs / PBs or Enlargement of cable entry holes by tapping or any modification required fixing of cable glands, fixing of glands, ferrules and tag plates and dressing.
3. Unit rates quoted for cabling shall also include supply of clamping/ dressing materials such as Aluminium/GI strips or PVC ties, ferrules, tag plates apart from the work mentioned above. Supply of above material shall conform to the specification detailed in Section VII.
4. The unit rate quoted for cable laying shall also cover the following works.
    a. Modification such as rotating the terminal box through 90° or 180° as required.
    b. Enlargement of cable entry holes, if necessary, by chipping/tapping or any modification required fixing of cable glands

c. Drilling of gland plates of equipment if not done already.

d. Reaming and relocating holes at actual point of entry of cable or conduit in terminal boxes, outlet boxes, pull boxes etc. cleaning off the debris/trapped material from conduit/ducts.

5. However any major modification like drilling, tapping etc. involved in fixing of glands in JBs and Terminal boxes same shall be considered as extra on man hour rate basis as per extra works clause.

6. Uniform unit rate shall be quoted for the cables whether laid on cable trays or routed through duct bank, conduits, cable shafts etc.

7. The contractor shall provide Tools/ equipment required for the connections and termination of cable wherever necessary. No separate rate shall be paid for cable terminations. For cable joining, if any, separate rate shall be considered on extra work basis.

8. If the cables are to be laid on the angles or routed in conduit pipe as per site condition, the unit rate for erection of angles and conduit pipes shall be as per the unit quoted elsewhere in the tender.

9. Any fabrication required at site for cable support shall be carried out at the rate quoted for fabrication.

10. The contractor shall carry out cable dressing and clamping for all the cables laid by the contractor. However, if any other agency laid cables of lesser quantity for which no separate trays have been allotted, the contractor shall do clamping along with the cables.

11. Wherever cable entry holes have not been provided for equipment installed by another agency, the contractor shall co-operate to get the same done.

12. During testing and commissioning, if the equipment on which the cables are terminated not functioning, it is the responsibility of the contractor to check and establish in coordination

13. with the commissioning agencies that there is no defect in the cabling, The contractor shall promptly depute his supervisor or technicians to assist the commissioning agencies to check the interconnecting cables.

14. Contractor shall carefully plan the cutting schedule for each cable drum in consultation with Engineer such that wastage is minimized and any resultant short lengths can be used where appropriate route lengths are available.

15. Cable installation shall be properly coordinated at site with other services and wherever necessary suitable adjustment shall be made in the cable routings with a view to avoid interference with any part of the building, structures, equipment, utilities and services any such adjustment shall be done with the approval of Engineer.

16. **The approximate number of termination other than power cable for the purpose of estimation to be considered as follows:**

    a. **Looping power cable (2X2.5 Sqmm) the average run length shall be considered as 10 mtrs.**

    b. **Control cable (1.5 Sqmm) the average run length shall be considered as 250 mtrs.**

    c. **pair cable (0.5 Sqmm)the average run length shall be considered as 50 mtrs.**

17. Irrespective of cable schedule, i.e. whether the laying of cables are covered in Electrical cable schedule or C&I cable schedule, contractor shall lay and terminate the all the cables covered in the BOQ as per directive of site BHEL Engineers

18. SCOPE OF CABLE TERMINATION

a. For all cable terminations, no. separate rate shall be paid except LT power cable .

b. Separate rate shall be paid for Power cable termination only.

c. The scope of termination shall also include, termination of cables on various equipment installed by others. The contractor shall work in co-operation with other agencies in obtaining correct direction of rotation and commissioning of the equipment.

d. The insulating sleeves shall be of fire resistant and be long enough to over pass conductor insulation and shall be properly sized.

e. The work of testing and reconnecting/rearrangements of leads if required, changing of connectors, shall be carried out without additional cost

f. Contractor shall arrange all type of termination and crimping Tools/ equipments required for the connections/terminations.

g. After cable terminations, the debris shall be removed then & there

h. **Only printed ferrules should be used and contractor shall arrange necessary ferrules printer.**

6.3.5 SCOPE OF CABLE TRAYS / CONDUITS/ FLEXIBLE CONDUITS.

1. CABLE TRAYS

a. Scope of cable tray works covers erection various sizes of ladder & perforated trays with accessories such as coupler plates/fixing plates, anchor bolts, fasteners etc

b. The scope of erection shall also covers erection all type of trays and its accessories such as coupler plates/fixing plates, anchor bolts, fasteners etc, fabrication of standard tray accessories such as TEES, Reducers, Bends (vertical and Horizontal), cross etc wherever required, and making of offsets by means of cutting standard tray sections and inserting suitable size of trays to match with the existing arrangement.

c. The unit rate for erection of trays shall be on meter basis which includes erection of trays and accessories, fabrication and erection of trays accessories and modification of straight trays . ..

d. No separate rate shall be paid for any fabrication of trays accessories or any modification on straight trays .

e. If trays covers are supplied same shall be erected after completion of cable lying and no separate payment will be made for fixing these covers. GI strip clamps are to be used for fixing the tray covers.

f. Welded Joints of trays shall be painted with red lead and aluminium paint in turn with bitumen as per IS 3043. The unit rate shall also include supply of paints, thinner, other consumables and brush etc.

2. RIGID & FLEXIBLE CONDUITS

a. Cables shall normally be laid on cable trays. However, in case of shorter routes where trays are not possible, suitable GI pipe/flexible conduits shall be used. Unit rate shall be paid on running meter basis.

b. The scope of works for flexible conduit includes drilling of the holes on the plates, fixing of the end connectors, providing suitable supports and fixing tag marks wherever specified as required by BHEL. The supply of suitable clamps, fasteners and tag plates are in contractor's scope.

c. In the case of flexible conduit laying for fixing end connectors, no separate payment will be made for connectors.

6.3.6 SCOPE OF FABRICATION & INSTALLATION OF STEEL MATERIALS

1. Scope of steel fabrication and installation covers, fabrication and installation of various supports that are required for flexible tray support systems, JB, Control Box/Panel, local push Buttons etc. with angles and channels of different size

2. The fabrication steel materials such as angles, channels, etc shall be supplied as standard lengths.

3. For fabrication, the rate shall be paid on tonnage basis and no separate rate shall be paid for erection of the same. i.e. the rate quoted shall include fabrication and installation. However, for earthing materials the rates shall be paid on meter basis.

4. Fabrication shall be carried out as per schemes in consultation with site engineers. Immediately after fabrication, primer shall be applied to prevent corrosion. The installation shall be carried out only after applying the primer as detailed in painting clause.

5. For fixing frames or supports if any minor grouting is required the same shall be carried out at free of cost. After installation of frames, grouting of the same is in the scope of contractor.

6. Supplies of all cement, sand etc. required for grouting of supports are in the scope of contractor.

7. **All the fabricated steel materials shall be painted as per the detailed in the scope of painting clause and no separate rate shall be paid for painting.**

6.3.7 SCOPE OF FLEXIBLE TRAY SUPPORT SYSTEMS

1. Erection scope of Flexible GI cable Tray support system(bolting Type), consisting of single/double channels, base plates, cantilever arms and other accessories such as angle fittings, flat plate fittings, clamps for single & double channels, fasteners etc.
2. Two different types of base plates are supplied i.e.Single channel and double channel base plates. Base plates are mostly to be welded and the welded portion is to be cleaned and coated with two coats of zinc rich primer paints, and cold galvanized paint coating or equivalent shall be applied to prevent corrosion.
3. Single channel or double channel are to be bolted to the base plate by fasteners which shall be supplied along with base plate.

4. Wherever necessary, base plate beam clamps will be supplied for bolting. Otherwise, the base plates are to be welded on the racks or beams.
5. Different sizes of cross arms for supporting the cable ray are to be assembled on the channels.
6. Fasteners are supplied with cross arms for fastening the cross arms with the support channels and for fixing the cable trays on the cross arms.
7. Single channel is used for one side cable trays and double channel accommodates trays on both sides.
8. Depending upon the number of tiers of cable trays, suitable lengths of channel is chosen.
9. Unit rate for base plate and cross arms shall be on Nos basis and for channel on running meter basis
10. No separate unit shall be paid for fixing of accessories such as angle fittings, flat plate fittings, clamps for single & double channels, fasteners etc and the rates shall be accommodated in the respective items mentioned in Sl.No 9.
11. Channels will be supplied in standard commercial lengths and same shall be cut at site as per requirement. Cutting of channels to be carried out only by power hacksaws and Gas cutting is not allowed
12. Exposed metal portion shall be painted as per specification given in section VI.
13. No separate rate will be paid for cutting & painting.

6.3.8 **SCOPE OF EARTHING**

1. The scope of earthing covered in this contract is above ground earthing mostly in ESP and VFD Area. Customer will provide earthing system comprising of main earthing conductor buried in soil, embedded in concrete in Power house areas. The scope covers Installation of earthing conductors and connecting equipments pertaining to the plant earth grid.
2. The contractor shall carry out earthing for all Electrical equipment which may be erected by the contractor 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 Section VII.
3. Unit rate for earthing material shall be paid on running metre basis
4. Connections to the equipments shall be bolted and the same shall be painted with anti- corrosive paint/ compound. Connection between the equipment earth lead and the grid conductor shall be welded. For rust protection, the welds shall be treated with zinc chromate primer and coated with zinc rich paint.
5. 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.
6. Wherever possible and as directed by site engineers, localized internal earthing ring shall be formed and connected to the ground earthing through vertical risers.

7. All equipment shall be earthed by two separate and distinct connections. Earthing terminals will be available in all the equipment supplied by BHEL.
8. A continuous earthing conductor shall be installed in all cables trays. When two or more trays supporting power cables run on parallel, 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.
9. 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. Parts of all electrical equipment and machinery not intended to be alive shall have two separate and distinct earth connections each to confirm to the stipulation of the Indian Electricity Rules and apparatus rated 240 V and below may have single earth connections.

6.3.9 **SCOPE OF PAINTING:**

1. The scope of painting generally covers all steel works carried out by the contractor such as supports, racks, frames, etc. Touch up painting only is generally required for trays, control panels, junction boxes and full painting shall be required only for specific equipments as per the scope of erection.

2. The scope also includes supply of paints, primers, consumables like brushes, emery papers, thinner etc.

3. The painting shall include two coats of Red oxide primer and two coats of final synthetic enamel painting approved by BHEL.

4. No separate rate shall be paid for painting and supply of paints, and other consumables. Painting shall be accommodated in the unit rate quoted for items which calls for painting as per scope of work

5. All damaged painted surfaces shall be cleaned and coated with two (2) coats of primer followed by a finishing coat of approved colour.

6. All damaged galvanized surfaces including cable trays shall be coated with cold galvanizing paint.

7. Unless otherwise instructed, final painting shall be carried out in the field, only after mechanical completion and completion of cable laying.

8. Paints shall be arranged from standard reputed suppliers in consultation with BHEL. All painting materials brought to site by contractor for application shall be procured directly from manufacturer as per specifications and shall be accompanied by manufacturer’s test certificates.

9. The paint manufacturer’s instructions shall be followed as far as practicable at all times. Particular attention shall be paid to Instructions for storage to avoid exposure as well as extremes of temperature, Surface preparation prior to painting, Mixing and thinning, Application of paints and the recommended limit on time intervals between coats.

6.3.10 **SCOPE OF CALIBRATION:**

1. Contractor shall calibrate all the local instruments, panel mounted instruments like protection relays, transducers, Recorders, Indicators, energy meter etc that will be supplied along with equipments mounted in or in loose
2. Contractor shall calibration records as per the format CP: PEX: FOX enclosed in the tender specification.
3. All testing Instruments/ Equipment deployed for calibration shall be calibrated before taking it into service. A copy of calibration certificate shall be submitted to BHEL Engineer for his verification and approval.
4. All testing instruments shall have calibration certificate issued by recognized/accredited agencies.
5. **BHEL shall provide vendors supports for proprietary type of microprocessor based instruments, protection relays which requires software loading and programmer etc. However overall responsibility lies with contractor and Contractor shall provide all supports like manpower, standard T&P, Instruments for calibration and testing of above proprietary type instruments**
6. **If BHEL is unable provide or arrange vendor support for above mentioned proprietary instruments, contractor shall carry out the calibration through authorized agency, at extra cost. The actual cost of such calibration carried out by out side agency shall be absorbed by BHEL. However if above such calibrator is available with BHEL at site the calibration shall be carried out by the contractor at free of cost.**
7. **The contractor shall carry out calibration with their own calibration and testing equipments and testing**

teams and should not engage outside agency for calibration and testing. Calibration and Testing shall be done under the supervision of BHEL/NTPC Engineers.

6.3.11 **SCOPE OF CIVIL WORKS**

Scope of civil works covers minor civil works required for installation of push button stations, Junction Boxes, Grouting of Transformer, sets etc. including supply of grouting materials like cement, sand etc. More details regarding scope of civil works are given in the respective equipment erection.

6.3.12 **SCOPE OF COMMISSIONING OF EQUIPMENT ERECTED BY THE MECHANICAL CONTRACTOR**

1- ALL TYPES OF HT DRIVES AND GENERATOR

a- Cable identification, checking and meggering.

b- IR value of motor, measurement of winding resistance etc.

c- Dryout all the motors if required to improve IR value.

d- Checking direction of rotation of motors and testing and commissioning from local as well as remote.

e- Checking the bushing and HV test/Tan delta test.

f- Attending to any defects till the handing over of the unit to customer

2- ALL TYPES OF LT DRIVES.

a- Cable identification, checking and meggering.

b- IR value of motor, measurement of winding resistance etc.

c- Dry out all the motors if required to improve IR value.

d- Limit switch setting

e- Checking direction of rotation of motors and testing and commissioning from local as well as remote.

f- Attending to any defects till the handing over of the unit to customer by BHEL

g- Replacing defective components like limit switches

3 - HOIST:

All cabling will be carried out by the vendors. However the scope of works of hoist covers besides works mentioned in Sl No1, the checking of control panels wiring, field wiring like push button, motors, and limit switch etc., fixing of Trailing cables, and making ready for load test by mechanical agency.

6.3.13 **SCOPE OF ASH LEVEL INDICATOR:**

1. Scope of Ash level indicator consists of erection of transmitters (electronic unit), PTF wires, probes (for high and low level sensing), flexible conduits etc. All PTF cables shall be routed through ¾" GI flexible conduits.
2. The unit rate quoted for each set consists of erection of transmitters (electronic units), fixing of probes, laying and termination of PTF cables through conduits, clamping of flexible conduits etc. The unit rate also covers supply of metallic clamps, lugs etc. Lumpsum rate shall be quoted for each set and no separate payment shall be made against erection of any individual item.

3 If any mounting frames are required for insulation of transmitters same shall be carried out on tonnage basis as applicable for other fabrication and erection.

6.3.14 **SCOPE OF HEATING ELEMENTS:**

1. Two types of heating elements shall be supplied (panel type and standard heating elements)
2. All heating elements shall be fixed by the mechanical contractor.
3. The panel type heating elements shall be supplied with extension cables and flexible conduits. Unit rate quoted for panel type heating element includes routing the extension cables through flexible conduits, dressing, terminations and checking of the heating elements.
4. Unit rate quoted for thermostat and other standard heating elements covers only checking of elements/thermostat.

6.3.15 **SCOPE OF WORK FOR ILLUMINATION PACKAGE**

The scope of work for Lighting System shall cover mainly Hydrogen Generation Plant Area.

The details of illumination work are as follows:

- Installation of lighting panel/ lighting distribution board
- Installation of lighting fixtures
- Installation of receptacles, switch boxes
- Installation of junction boxes, clamps, connectors, flexible conduits etc.
- Installation of GI conduits.
- Wiring for lighting system.
- Supply and installation of PVC grips for fixing screws in RCC slabs, conduit plugs, lock nuts for conduits and all type of accessories, all types of fixing screws, ferrules, cable identification tags, cable dressing materials etc. as required.
- Supply of all consumables and hardware for installation of

lighting system like clamps, bolts, nuts, brackets, anchor fasteners etc., as required

- Supply of adequate quantity of touch up paint.
- Supply and installation of other accessories which have not been specifically indicated but may be required for completion of installation.
- Arranging all scaffolding and platforms, as required for installation of lighting system.

GENERAL INSTALLATION REQUIREMENTS FOR ILLUMINATION PACKAGE

1 Installation work shall be carried out in accordance with good engineering practices and also as per manufacturer's instruction/recommendations where the same are available. Equipment shall be installed with neat workmanship so that it is level, plumb, square and properly aligned and oriented.

2 The location of the lighting panels and lighting fixtures with circuit designation shall be indicated in drawings. The various receptacles, switches, Lighting fixtures etc. shall be installed as per the lighting layout drawings. The exact mounting of Lighting fixtures will be decided at site depending upon the actual space/other facilities available at site. The location shall be chosen in such a manner as to avoid interference with piping/cable trays or other equipment and to avoid objectionable shadows.

3 Before installation, light fittings, switches, receptacles etc. shall be checked for tightness of internal connection and insulation value. Fixtures shall be firmly supported from structures. Clamps may be bolted or welded to the existing steelworks. In case of concrete structures, fixtures will be fixed with the help of anchor fasteners. In false ceiling areas, fixtures shall be supported from the true ceiling.

4 Receptacles and lighting circuits shall be fed from different circuits. The switch controlling these circuits shall be on the live side (phase wire) of the circuits.

5 Lighting fixtures, receptacles, switches, conduits and junction boxes etc., shall be properly earthed.

6 Lighting Panels (LP) and JBs

The scope of work for LPs and JBs will be in line with Electrical Panels and the unit rate quoted shall include providing supports for the base, anchor fasteners, bolts, nuts etc.

LPs shall be mounted on floor/ walls/columns/steel structures at the locations indicated in the drawings. All support materials required for installation of LPs shall be fabricated at site on Tonnage basis. Material for the same shall be supplied by BHEL. Unless specified otherwise in the drawings, the height of the centre line of LPs from the floor shall be 1200 mm. In case the same is to be mounted on foundation, the foundation bolts and grouting materials shall be arranged by the contractor.

7 Lighting Fixtures

Various lighting fixtures like indoor surface mounted fixtures, indoor recess mounted fixtures, well glass fixtures etc. as well as lamps will be supplied by BHEL as detailed in the BOQ.

The unit rate quoted for erection of fixtures shall include installation of all associated accessories, providing necessary supports wherever required, supply of consumables like brackets, screws, minor civil work like chipping etc.

8 Cabling (specific for Illumination Package)

Cable installation work shall be generally in line with the Scope of work for Cabling covered elsewhere.

9 Lighting Wires

All lighting wires shall be crimped using suitable type of solderless, crimping, tinned fork type copper lugs. Cost of the lugs shall be included in the erection price of wire.

All lighting wires shall be run in conduits. Not more than two circuits shall be run in each. Each phase shall be run in separate conduits only.

Lighting wires from lighting panels to junction boxes and junction boxes to lighting fixtures, switch boxes and receptacle boxes shall run in conduits (Rigid/flexible).

All wires in a conduit shall be drawn simultaneously. No subsequent drawing is permissible. Wires shall not be pulled thorough more than two equivalent 90 deg. Bends in a single conduit run. Wherever required, suitable conduit junction boxes/pull boxes shall be provided. All types of wiring, concealed or unconcealed shall be capable of easy inspection.

The unit rate quoted for wires shall include pulling of earth wires and supply of ferrules.

10 Rigid & Flexible Conduits

The rate quoted for laying of conduit shall include supply and fixing of all associated accessories like bends, elbows, clamps, pull boxes, etc., supply and installation of PVC grips for fixing screws in RCC slabs, conduit plugs and lock nuts for conduits.

11 Earthing (specific for Illumination Package)

A continuous earth conductor of 14 SWG GI wire shall be run all along the entire length of the conduit between the fixture and the corresponding lighting panel where it will be connected to the station earth.

For fixtures in hazardous areas, the third core of each single-phase armoured cable circuit shall be used as earthing conductor.

Whether specifically shown or not, all conduits, trays, and cable end box, electrical equipment such as switchboards, panels, cabinets, junction boxes, fittings, fixtures, etc. shall be effectively grounded.

6.3.16 **SCOPE OF PRE-COMMISSIONING/ COMMISSIONING AND POST COMMISSIONING:**

1 The scope of commissioning works covers commissioning of all Electrical instruments/equipments/systems covered in the BOQ including loop checking and establishing the operation of instruments/equipments/systems to meet plant commissioning/operation. BHEL will provide vendor supports for special or proprietary type instruments/systems and contractor engineers/supervisors shall associate with the vendors and provide necessary manpower, T&P etc. The contractor shall be responsible for overall commissioning of all the instruments and systems covered in the BOQ.

2 Scope of commissioning starts with the commissioning of various equipment/ instruments/ systems erected by the contractor and making them available, as required, for the various commissioning activities of the main plants. The commissioning activities of the main plant shall be as below:

a. Trial run of various equipment.

b. Light up of boiler.

c. Boiler acid cleaning.

d. Boiler alkali boil out.

e. Turbine barring gear.

f. Steam blowing of piping.

g. Turbine rolling.

h. Safety valve floating.

i. First synchronization of unit.

j. Heavy oil firing and synchronization.

k. Coal firing of boiler.

l. Full load operation of unit.

The above commissioning activities, tests, trial runs may have to be repeated till satisfactory results are obtained to the satisfaction of customer / consultant / statutory authorities like boiler inspector, electrical inspector etc. The contractor shall co-ordinate with other contractor's during the above main plant commissioning activities to ensure successful commissioning of total plant.

3 The pre commissioning activities of the main power plant will start with run of various equipments prior to light up of boiler and commissioning operations shall continue till the unit is handed over to customer. The contractor shall simultaneously start commissioning activities for the equipment erected to match with the various milestone activities of commissioning programme of the project.

4 Contractor shall arrange specialized commissioning engineers, supervisors, electricians, and instrument mechanics in each area to be associated with BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. The manpower shall not be disturbed or diverted. It shall be specifically noted that above employees of the contractor may have to work round the clock along with BHEL commissioning engineers involving considerable payment of overtime, which forms part of Contractors Scope

5 The mobilization of these commissioning groups shall be such that planned activities are taken up in time and also

completed as per schedule and the work undertaken round the clock if required. It is the responsibility of contractor to discuss on day to day / weekly / monthly basis the requirement of manpower, consumables, tools and tackles with BHEL engineer and arrange for the same.

6 If at any time the requisite manpower, consumables, T & P are not arranged by the contractor to meet the schedule, BHEL shall make alternate arrangements and recover the cost with overhead from the running bills of the contractor.

7 After erection of various equipment prior to commissioning and after commissioning, protocols have to be made with BHEL's customer. The formats will be given by BHEL and have to be printed by the contractor in adequate numbers.

8 For electrical works, 415 volts and above, the contractor has to bring qualified electricians and the total work has to be certified by electrical license holder.

9 Incase any rework / repair /rectification/modification /fabrication etc. is required because of contractor's faulty erection which is noticed during commissioning at any stage, the same has to be rectified by the contractor at his cost. If during commissioning, any improvement / repair / rework / rectification / fabrication / modification due to design improvement / requirement is involved, the same shall be carried out by the contractor promptly and expeditiously. Claims if any, for such works from the contractor shall be governed by clauses covered elsewhere.

10 During commissioning activities and carrying out various tests, if any of the instruments has to be temporarily erected and commissioned to suit the commissioning activities, the contractor have to carry out the erection of the same. After completion of activities the temporary systems have to be removed and returned to stores and no extra rate shall be paid for this.

11 Minimum requirement of Man Power for commissioning works per unit shall be as follows:

	For Units 4 & 5 (2 x 500 MW)
Engineer Electrical	3 Nos.
Supervisor	6 Nos.
Technician (C&I/ Elec)	10 Nos.

12 The above commissioning group shall be identified at the Pre-commissioning and commissioning time. The above commissioning group shall have the knowledge of various systems referred in the tender and also should have adequate experience. The above manpower for commissioning is only tentative and for any additional manpower as per site requirement the same shall be arranged by the contractor.

13 If the contractor fails to deploy the above Engineer/Supervisor/ Technician at appropriate time of commissioning, no payment shall be made against commissioning activities as per terms of payment.

14 All the T&P instruments required for commissioning are to be arranged by the contractor. (However, any special instruments, which are of proprietary nature, shall be arranged by BHEL.)

15 It shall be the responsibility of the contractor to arrange and complete all the testing, pre-commissioning and commissioning activities for the particular equipment as per relevant standard, code of practice, manufacturer's instructions and BHEL norms. All the above will be witnessed by the BHEL engineers and reports signed shortly. Contractor shall follow checklist of BHEL and testing &

commissioning activities shall be carried out in accordance with the checklist.

16 **The scope of commissioning shall also cover the commissioning of the equipment/drives** erected **by the mechanical contractors. (as detailed in the BOQ)**

6.4.0 TIME SCHEDULE

1 The contractor shall mobilize his resources and work force within two weeks from the date of telegraphic LOI in such a manner that the entire Electrical work covered in his scope is completed to match the following commissioning programme.

a. 500MW: Unit 4&5

- Unit 4 shall be started by June -06 and completed by July-07 with Trial operation completion
- Unit 5 shall be started with phase shift of 4 months and completed by Nov-07 with trial operation completion

2. The above time schedule is only indicative. Depending up on the availability of work front, works can be taken up.

3. BHEL, owing to its commitment to their customer, may ask contractor to compress the total completion schedule. Contractor shall plan his activities and mobilize additional resources accordingly to the satisfaction of BHEL engineer within the quoted rates.

4. The contractor shall reach site and establish his site office and mobilize to commence the work as per directions of BHEL engineer. The date of starting the work at site shall be fixed in consultation with BHEL's engineer and the same shall be recorded in measurement book while entering the first RA bill.

5. Subject to availability of materials and other inputs, it is the responsibility of the contractor to carry out work to achieve the monthly progress and keep up the schedules.
6. Contractor shall draw the monthly erection programme along with BHEL engineer indicating the work to be achieved and events to be completed. Once the programme is drawn, he shall adhere to the same. Contractor shall plan and erect the materials as it is received at site. The monthly planned percentage shall take into consideration the material available at site before the start of the month and also any material received during the month. Contractor shall mobilize his resources required to achieve the monthly programme.
7. The work under this scope of contract is deemed to be completed in all respects only when all the items/materials/equipment is erected and trial runs, testing and commissioning the equipment are completed. The decision of BHEL in this respect shall be final and binding with the contractor.

CONTRACT PERIOD

8. The total contract period for completion entire work shall be **18 months** from the start of erection activity. The contractor shall complete all the works in the scope of this contract within this period. The date of start of erection work at site shall only be considered as commencement of contract period and shall be certified by BHEL.

GRACE PERIOD

9. Grace period of **THREE (3)** months beyond the contract period of **18** months is provided for this contract.

10. The work under this scope of contract is deemed to be completed in all respects only when all the items / materials / equipments are erected and trial runs, testing and commissioning the equipment are completed. The decision of BHEL in this respect shall be final and binding with the contractor.

11. During the tenure of contract, if BHEL is not satisfied with the progress of work, BHEL have the right to withdraw any portion of work / balance work and get the same done either directly employing their own personnel or through other agency at the risk & cost of the Contractor. The contractor shall not be entitled for any compensation whatsoever in this regard.

6.5.0 OVER RUN CHARGES

1 In case due to reasons not attributable to the contractor, the work gets delayed and completion time gets extended beyond 18 (Eighteen) months from the date of commencement of the work, the contractor shall not be entitled for any over run compensation (ORC) for a period of First THREE months after the expiry of 18 months. In case ORC arise the same will apply @ Rs.25,000/- (Rupees Twenty five thousand only) per month for extension to the completion period beyond 21(18+3) months as stated above duly taking into account the balance work at the end of that period.

2 The period of over run will have to be ascertained before the commencement of grace period

3 During the period of over run targets will be fixed on month to month basis, which have to be adhered. In case of any shortfall due to the reasons attributable to the contractor, ORC amount will be proportionately reduced.

The payment of over run charges for extended stay for reasons not attributable to contractor will be subject to achieving the monthly programme of work as mutually agreed upon during the extended stay.

6.6.0 MEASUREMENTS & WASTAGE & CUTTING ALLOWANCES:

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.

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

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 All materials returned to stores should carry an aluminium tag indicating the size and type. More than 5 metres length 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.

5 While carrying out material appropriation with contractor, all the above points will be taken into account. All serviceable material returned by the contractor shall be deducted from the quantities issued for the respective sizes and categories and the balance quantity(ies) will be taken as the net quantity(ies) issued to the contractor. Material appropriation shall be done and allowable scrap quantity calculated as per wastage allowance specified in Section VII. 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.

6 For all site-fabricated steel items such as supports, racks, frames, 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.

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.

8 The wastage allowances as permissible for various items are indicated in Section VII. Cutting and wastage allowance shall be computed on the lengths and weight of materials actually used, measured and accepted.

9 The erection contractor shall make every effort to minimize wastage during erection work. In any case, the wastage shall not exceed the following limits;

Sl.No.	Item	% Wastage on issued Qty
a.	Fabrication steel	2
b.	Each size of power cables	1
c.	Each size of control/Inst cables	2
d.	Trays	1

10 If however, the bidder quotes for more wastage than specified above, the excess portion will be considered for adjustment during the tender evaluation at the quoted supply rate of material.

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

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

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 tubes, 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.

6.7.0 COLLECTION OF BHEL SCOPE OF SUPPLY MATERIALS

1. BHEL shall issue materials covered in BHEL scope from their stores at site. The contractor shall collect such materials from BHEL stores and transport to his worksite at the contractor's cost.
2. The contractor shall inspect such materials as soon as received by the contractor and shall bring to the attention of the Engineer-in-Charge any shortage / damage or other defects noticed before taking over the materials. Materials once taken over will be deemed to have been received in good condition and in correct quantities except for intrinsic defects which cannot be observed by visual and dimensional inspection and weighing.
3. Upon receipt by the contractor the responsibility for any loss, damage and / or misuse of such materials shall rest with the contractor.
4. All materials issued by BHEL shall be properly stored and systematic records of receipts, issue and disposal will be maintained. Periodic inventory shall be made available to BHEL Engineer-in-Charge.
5. All materials issued by BHEL shall be utilized as directed by Engineer-in-Charge or most economically in the absence of such direction. The contractor shall be responsible for the return to BHEL Stores of all surplus material, as determined by the Engineer-in-Charge.

6. If the materials issued by BHEL are lost, damaged or unaccounted, the cost of such items shall be recovered from payments to the contractor. However, the contractor shall raise FIR and inform BHEL all details.

6.8.0 TOOLS AND PLANT TO BE ARRANGED BY THE CONTRACTOR

1. Equipment, vehicles, tools and plants and materials brought to site by the contractor from his resources shall have distinctive identification marks and the contractor shall intimate the description and quantity to BHEL in writing.
2. All construction materials brought by the contractor shall have prior approval regarding quality and quantity by BHEL. The contractor shall also provide without extra cost necessary enclosures containers and protective materials for proper storage of materials inside, whenever so instructed by the purchaser without any extra cost.
3. No material or equipment or tools etc. shall be taken out of the work-site without the written consent of BHEL.
4. BHEL shall not be responsible for the safety and protection of the materials of the contractor and the contractor shall make his arrangements for proper watch and ward for his materials.

   Until such time the work is taken over by BHEL, the contractor shall be responsible for proper protection including proper fencing, guarding, lighting, flagging, watching. The contractor shall during the progress of work properly cover up and protect any part of the work liable to damage by exposure to the weather and shall take every reasonable precaution against accident or damage to the work from any cause.

6.9.0 STORAGE:

1. The equipment should be preferably in its original package and should not be unpacked until absolutely necessary for its installation. The equipment should be best protected in its cases. It should be arranged away from walls.
2. The wooden pallet provided for packing itself can be retained for raised platform to protect equipment from ground damps, sinking into ground and to circulate air under the stored equipment. This will also help in lifting the packing with fort lift truck.
3. Periodic inspection of silica gel placed inside the equipment is necessary. It has to be replaced when decolourisation takes place or degenerated.
4. Due care should be taken to ensure that the equipment is not exposed to fumes, gases etc. which can affect electrical contacts of relays and terminal boards.
5. The storage room and the equipment should be checked at regular intervals to ensure protection from termites, mould growth, condensation of water etc. which can damage the equipment.
6. All the equipment, materials and goods kept in the store room should be identified and registered in a book. Inspection report should be recorded. Any discrepancy observed should be communicated to site.
7. Packing material shall be retained if the cubicle to be repacked after inspection.
8. Sub-Assemblies
    a. All sub-assemblies should be kept in a separate place where it is easily accessible.

b. Sub-assemblies should have a protective cover in case it is stored without wooden packing/case to prevent accumulation of dust. Silica gel packets should also be kept along with it.

c. Sub-assemblies should not be stacked one above the other.

9. Loose items (wherever applicable)

The loose items supplied for the main equipment falls into various categories like tools, cables, prefabricated cables, console inserts, recorders, modules and display units, printers, sensors and transducers, cable glands, cable ducts, frames etc. These are to be categorized and stored separately.

6.10.0 TERMS OF PAYMENT

The contractor should submit his monthly on account monthly bill with all the detail required by BHEL on specified date every month covering progress of work in all respects and areas from the 25th of previous calendar month to 24th of the current month.

1. LT SWITCHGEAR

a.	Receipt, transport to erection site, assembly, checking, calibration, fixing and clamping Adjustment, Alignment, on pro rata basis and protocol signed	75%
b.	Pre-commissioning tests, checks, and making ready for energisation pro rata basis and protocol signed	15%
c.	Completion of pending points & submission of final bills	5%
d.	After guarantee period	5%

2 VFD SYTEMS

a.	Receipt, transport to erection site on prorata basis	10%
b.	Placement, assembly fixing and clamping on prorata basis	40%
c.	Adjustment, Alignment, grouting and electrical interconnections and oil filtration on prorata basis	20%
d.	Pre-commissioning tests, checks, calibration and making ready for energisation on prorata basis	20%
e.	On submission of final bills	5%
f.	After guarantee period	5%

3 CABLE LAYING & CABLE TERMINATION

a.	Laying and tagging on prorata rate basis	75%
b.	After termination and dressing on prorata rate basis	15%
c.	On submission of as build drawing and final bills	5%
d.	After guarantee period	5 %

4 FABRICATION AND INSTALLATION OF STEEL MATERIAL

a.	After fabrication and applying of primer on prorate basis	50%
b.	After installation on prorata rate basis	40%
c.	On completion painting and submission of final bills	5%
d.	After guarantee period	5 %

5 CABLE TRAYS, TRAY SUPPORTS, RIGID & FLEXIBLE CONDUITS, ABOVE GROUND EARTHING

a.	After satisfactory completion of work on prorata rate basis	75%
b.	After completing drawing wise on prorata rate basis	15%
c.	On submission of final bills	5 %
d.	After guarantee period	5 %

6 ILLUMINATION

a.	After satisfactory completion of work on prorata rate basis	75%
b.	After energizing all the circuits	15%
c.	On submission of final bills	5 %
d.	After guarantee period	5 %

7 ESP TRANSFORMERS

a.	Oil filtration and satisfactory BDV checking on prorata basis	50%
b.	Pre commissioning checks, tests, calibration on prorata basis	25%
c.	Energisation and commissioning on prorata basis	15 %
d.	On submission of final bills	5 %
e	After guarantee period	5 %

8 OTHER ITEMS WHICH ARE NOT COVERED IN THE ABOVE TERMS OF PAYMENT, THE PAYMENT SHALL BE MADE AS UNDER

a.	75% of the accepted rate for the respective item of work on prorata basis on satisfactory completion of work.
b.	15% of the accepted rate on commissioning of the system.
c.	5 % on submission and passing of final bills
d.	5% after guarantee period.

The Guarantee amount of 5% of the contract value (arrived at the actual quantity erected multiplied by unit rate accepted) will be paid after the guarantee period of 12 months is over separately. The guarantee period shall commence from the date of completion of trail run of the unit or 6 months from the date of first synchronization of the set whichever is earlier, provided all erection, testing and commissioning works are completed in all respects. However the above 5% payment can be released against submission of a matching bank guarantee from a nationalised / scheduled bank in the prescribed Performa of BHEL valid for one year from the date commencement of guarantee period.

6.10.1 BHEL at discretion, may further split-up the above percentage and effect payment to suit the site conditions, cash flow requirements, according to the progress of work.

6.10.2 Field quality assurance formats: It is the responsibility of the contractor to collect and fill up the relevant FQA log sheets / welding logs & Heat treatment charts and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL / Customer in token of their acceptance. Monthly RB payment to the contractor will be linked with the submission of these log sheets.

6.10.3 No levy or payment or charge made or imposed shall be impeached by reasons for any clerical error or demanded or charged.

6.10.4 **CONTRACTOR SHALL NOTE THAT THE FINAL BILL WILL BE RELEASED ONLY ON PRODUCTION OF A CERTIFICATE ISSUED BY SITE IN CHARGE THAT THE CONTRACTOR HAS FULFILLED ALL THE CONTRACTUAL / STATUTORY REQUIREMENT**.

6.11.0 GUARANTEE

1. All the works executed by the contractor including supplies are to be guaranteed for a period of 12 months from the date of taking over of the work. The contractor shall be responsible for the quality of workmanship and shall guarantee the work done, shall rectify/replace at free of cost all defects due to faulty supply/erection and commissioning during the guarantee period.
2. In the event of contractor failing to replace/repair the defective supplies/works within the time required BHEL may proceed to undertake the replacement/repairs of such defective supplies/works at the contractor's risk and cost without prejudice to any other points/right.

6.12.0 MATERIALS/CONSUMABLES TO BE ARRANGED BY THE CONTRACTOR FOR ERECTION AND COMMISSIONING AS PART OF THE SCOPE AT FREE OF COST

1. Welding electrodes, gas for steel fabrication
2. Provision for Temporary Scaffoldings.
3. "U" Clamps with nuts and washers for GI pipe clamping.
4. Tags- Plates.
5. Insulation tape.
6. Hole tight/Bitumen tape for GI pipe coupling.
7. Paints required for primer coating and final synthetic enamel coating and for protective coating.
8. Solder wire (Lead) -(60/40)
9. Protocol/Calibration report sheets as per BHEL Format.
10. Panel Sealing compound material (for cable entry from bottom/Top of Panel).
11. PVC cable tie, Aluminum or GI strips and fasteners for clamping of cables and other dressing materials required for cable dressing.(if any cabling works carried out)
12. Ferrules for cables(if any cabling works carried out)
13. Fasteners required fro fixing of push button and Junction boxes etc.
14. Chromate for Junction boxes/Push button.

6.13.0 PRICE ESCALATION

1. The finally accepted rates for scope of work as defined in this tender are subjected to price escalation provisions as per the following formulae.

    a. P1 = 0.75 x P0 (F1-F0)/F0

    b. P1 = Increase in billing amount (escalation for the particular month of billing)

    c. P0 = Billing amount calculated on the accepted tonnage rate

d. F1 = All India CPI published by Labour Bureau, Simla, Government of India for Industrial workers (Base 2001 - 100) applicable for the month under consideration i.e. for which bill has been raised.

e. F0 = ll India CPI published by Labour Bureau, Simla Government of India for Industrial workers (Base 2001-100) applicable for the month of commencement of work.

2. Price escalation as per above formula will be calculated and paid on the total contract value (excluding payments towards extra works and overrun, if any), on month to month basis from the date of award with no limits/ceiling. BHEL however reserves the right to freeze escalation for that such of duration of delays, from time to time, which are entirely attributable to the contractor.

3. With the provision of prior escalation no claim/compensation on account of any increase whatsoever, (irrespective of whether escalation are steep/ unanticipated or not compensated by the above escalation provisions in full towards minimum wages, consumables, electrodes gases or any other items/reason) will be payable during the entire period of execution including extended period, if any.

6.14.0 ELECTRICAL INSPECTORATE'S APPROVAL:

1. All electrical installation covered in contractor's scope which also includes equipments covered in commissioning assistance are to be inspected/approved by the electrical inspector/statutory authority. For getting electrical inspector's approval, contractor shall arrange the following:

a. Completion certificate for all the equipment covered in the contract

b. Copy of Test results conducted at site for all the equipment including Electrical Equipment erected by Mechanical Contractor.

c. All other documents as required by statutory authority.

d. Contractor shall carry out the modifications/rectifications if any as suggested by the authority at his cost. However, it is not applicable for equipment erected by Mechanical contractor.

2. Contractor shall also have valid electrical installation license on his company as well as for individuals acceptable to respective state electrical inspectorate requirement.

3. BHEL shall pay all other fees (FEES FOR VISITS, INSPECTION FEES, REGISTRATION FEES, etc.). However any expenditure related to documentation shall be born by contractor.

6.15.0 PROGRESS AND MONITORING OF WORK

1. It is the responsibility of the contractor to provide all relevant information on a regular basis regarding erection progress, labour availability, equipment deployment, testing, etc.

2. contractor shall submit daily, weekly and monthly progress reports, manpower reports, material reports, equipment reports etc. as per formats specified by BHEL. The progress reports shall indicate the progress achieved against plan, indicating reasons for delays, if any. The report shall also give remedial actions by which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original plan and the slippages do not accumulate and affect the overall programme.
3. The progress reports shall reflect actual progress achieved during the month and shall be submitted to BHEL, so that slippages can be observed and necessary action taken in order to ensure that the situation does not get out of control. The contractor shall update the construction schedule forming part of this contract each month.
4. If required by BHEL, the contractor shall change the sequence of his operation so that work on priority sectors can be completed within the project schedule. The contractor shall afford maximum assistance to BHEL in this connection without causing delay to agreed completion date.
5. In addition a weekly / fortnightly progress meeting will be held at BHEL site office for coordinating job progress and all agreements reached there shall be maintained.
6. Wherever erection sequences are furnished by BHEL, the contractor shall follow the same sequence.
7. The contractor shall submit daily report of the number of men on the job category-wise, showing where men are working, type of work being performed by area or system as required by BHEL

6.16.0 INSPECTION OF WORKS

1. BHEL/Customer will have full power and authority to inspect the works at any time, either on the site or at the contractor's premises. The contractor shall arrange every facility and assistance to carry out such inspection. On no account will the contractor be allowed to proceed with work of any type unless such work has been inspected and entries are made in the site inspection register by customer.
2. Wherever the performance of work by the contractor is not satisfactory in respect of workmanship, deployment of sufficient labour or equipment, delay in execution of work or any other matter, BHEL shall have the right to engage labour at normal ruling rates and get the work executed through other agency and debit the cost to the contractor and the contractor shall have no right to claim compensation thereof. In such a case, BHEL shall have the right to utilize the materials and tools brought by the contractors for the same work.

6.17.0 CONTRACT VARIATION

The quantities shown in rate schedule are only estimated and the payment will be made on the actual quantity executed on unit rate basis and no compensation or revision of rates is envisaged for any upward variation in quantities.

6.18.0 **EXTRA CHARGES FOR MODIFICATION AND RECTIFICATION WORK**EL may consider payment for extra works on man day basis for such of those works which require major revamping / rework / rectification / modification which is totally unusual to normal erection or commissioning work which are not due to contractor's faulty erection.

1. The decision of BHEL in this regard shall be final and binding on the contractor. The contractor may submit his work claim bills specifically agreed by BHEL Engineer along with the labour sheet duly certified by BHEL engineer at site. But BHEL also got the option to get those work done through other agencies if they so desire.
2. All the extra work, if any, carried out should be done by a separate gang which should be identified prior to start of work for certification, of man hours. Daily labour sheets should be maintained and should be signed by contractor's representative and BHEL Engineer. Signing of the labour sheets does not necessarily mean the acceptance of extra works. Only those works which are identified as not usual to normal erection and certified so by the Project Manager and accepted by designers/supplier or competent authority only will be considered for payment.
3. The decision of BHEL in this regard shall be final and binding on the contractor.
4. BHEL may consider payment for extra works on man day basis for such of those works which require major revamping / rework / rectification / modification which is totally unusual to normal erection or commissioning work which are not due to contractor's faulty erection
5. The following man hour rates will be applicable for modification/rectification work.

a. Average single manhour rate including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, including consumables for carrying out any rework revamping as may arise during the course of erection – Rs. 40/- per man hour.

b. Average single man hour rate including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals excluding consumables for carrying out any rework/revamping as may arise during the course of erection – Rs. 25/- per man hour**.**

6. Extra works are broadly defined as below:

a. Design changes which will be intimated the contractor after the start of the work which calls for dismantling of the erected components, rectification, modification, etc.

b. Modification , rectification of erection wrongly erected /fabricated at site as per drawing subject to acceptance by approving authority.

c. Jobs which require major modification, major repair, major reworks etc which will be identified as major and warrant extra, payment, certified as such by the Project Manager and accepted by the designers/competent authority of BHEL.

7. However prior to carryout the repair/rework administrative approval with the estimate to be obtained by Site.

8. The decision of BHEL in this regard shall be final and binding on the contractor.

9. **EXTRA WORK DOES NOT INCLUDE** :

   a. Nominal dressing of foundations, holes, bases, nuts and bolts, incase of abnormal conditions, this can be mutually discussed before starting of such work.

6.19.0 REPORTING DAMAGES AND CARRYING OUT REPAIRS

1. Checking all components/equipments at siding/site and reporting to transport and/or insurance authorities of any damages/losses will be by BHEL.
2. Contractor shall render all help to BHEL in inspection including handling, re-stacking etc, assessing and preparing estimates for repairs of components damaged during transit, storage and erection, commissioning and preparing estimates for fabrication of materials lost/damaged during transit, storage and erection. Contractor shall help BHEL to furnish all the data required by railways, insurance company or their surveyors.
3. Contractor, shall report to BHEL in writing any damages to equipments/components on receipt, storing, and during drawl of the materials from stores, in transit to site and unloading at place of work and during erection and commissioning. The above report shall be as prescribed by BHEL site management. Any consequential loss arising out of non-compliance of this stipulation will be borne by contractor.

6.20.0 SPLITTING OF THE WORK

1. BHEL also reserves the right to split up work of this tender specification and award the same to more than one contractor on each unit basis or in any other fashion and deemed fit.

2. The terminal points, decided by BHEL is final and binding on the contractor for effecting payment for the work done or distributing and work in case of splitting the work among more than one contract.

6.21.0 FORECLOSING THE CONTRACT

1. BHEL at its discretion may foreclose the contract at any time after the completion of contract period from the date of starting the work at site.
2. In case it is decided to withdraw any portion of work or foreclose the contract, the percentage value of the work withdrawn/left over shall be determined mutually. BHEL engineer's decision in regard to status of an item shall be final and binding on the contractor.

6.22.0 TAXES

1. Not withstanding the fact that this is only an erection service contract not involving any transfer of materials whatsoever and not attracting any sales tax liability, being labour oriented job work, for the purpose of Sales Tax the contractor has to maintain the complete data relating to the expenditure incurred towards wages etc. in respect of the staff/workers employed for this work as also details of purchase of materials like consumables, spares etc., inter alia indicating the name of the supplier, address and ST Registration No. and ST paid and should furnish to BHEL at the year end.

2. The contractor has to register under local Sales Tax-Law and get assessed. The contractor has to give a certificate each year that the returns and submitted regularly and the turnover on this contract is included in his sales tax return. The sales tax registration number and certificate is to be furnished at site soon after the award of contract. However in case delay is anticipated in obtaining S.T. Regn. No. a copy of application for registration filed with ST Authorities shall be submitted along with first running bill and the ST Regn. No. will be submitted within a reasonable time.
3. The final bill amount would be paid only after submission of proof of inclusion of the turnover of this contract in the ST Returns or ST Clearance certificate. The ST deduction at source will be made from running bills, unless necessary exemption is produced.

6.23.0 PROVIDENT FUND & MINIMUM WAGES

1. Your are required to extent the benefit of Provident Fund to the labour employed by you in connection with this contract as per the Employees Provident Fund and Miscellaneous Provisions Act 1952. For due implementation of the same, you are hereby required to get yourself registered with the Provident Fund authorities for the purpose of reconciliation of PF dues and furnish to us the code number allotted to you by the Provident Fund authorities within one month from the date of issue of this letter of intent. In case you are exempted from such remittance an attested copy of authority for such exemption is to be furnished. Please note that in the event of your failure to comply with the provisions of said Act, if recoveries therefore are enforced from payments due to us by the customer or paid to statutory authorities by us, such amount will be recovered from payments due to you.

2. The contractor shall ensure the payments of minimum labour wages to the workmen under him as per the rules applicable from time to time in the state.
3. The final bill amount would be released only on production of clearance certificate from PF/ESI and labour authorities as applicable.

6.24.0 IMPORTANT CONDITIONS FOR PAYMENT :

It may be noted that the first running bill will be released only on production of the following :

I PF regn No

ii) Labour Licence No

iii) Workmen insurance policy No

iv) Un Qualified Acceptance for Detailed LOI

v) Initial 50% Security Deposit

vi) Rs 100/= Stamp paper for preparation of Contract agreement

6.25.0 **OTHER STATUTORY REQUIREMENTS** :

6.25.1 The Contractor shall submit a copy of Labour License obtained from the Licensing Officer (Form VI) u/r25 read with u/s 12 of Contract Labour (R&A) Act 1970 & rules and Valid WC Insurance copy or ESI Code (if applicable) and PF code no along with the **first** running bill.

6.25.2 The contactor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r78(1)(a)(1) of Contract Labour Rules, copies of monthly return of PF contribution with remittance Challans under Employees Provident Fund Act 1952 and copy of renewed WC Insurance policy or copies of monthly return of ESI

contribution with Challans under ESI Act 1948 (if applicable) in respect of the workmen engaged by them.

6.25.3 The contractor should ensure compliance of Sec 21 of Contract Labour (R&A) Act 1970 regarding responsibility for payment of Wages. Incase of "Non-compliance of Sec 21 or non-payment of wages" to the workmen before the expiry of wage period by the contactor, BHEL will reserve its right to pay the workmen under the orders of Appropriate authority at the risk and cost of the Contractor.

6.25.4 The contractor shall submit copies of Final Settlement statement of disbursal of retrenchment benefits on retrenchment of each workmen under I D Act 1948, copies of Form 6-A(Annual Return of PF Contribution) along with Copies of PF Contribution Card of each member under PF Act and copies of monthly return on ESI Contribution – Form 6 under ESI Act1948 (If applicable) to BHEL along with the Final Bill.

6.25.5 In case of any dispute pending before the Appropriate authority under I D act 1948, WC Act 1923 or ESI Act 1948 and PF Act 1952, BHEL reserve the right to hold such amounts from the final bills of the Contractor which will be released on submission of proof of settlement of issues from the appropriate authority under the act.

6.25.6 Incase of any dispute prolonged/pending before the authority for the reasons not attributable to the contractor, BHEL reserves the right to release the final bill of the contractor on submission of Indemnity bond by the contractor indemnifying BHEL against any claims that may arise at a later date without prejudice to the rights of BHEL.

6.26.0 SERVICE TAXES

Service Tax as applicable for this Contract will be paid extra by BHEL.

6.26.1 The contractor may claim the Service Tax in their R.A.bill and the same will be paid by BHEL, on production of copy of registration certificate. Proof of remittance of service tax by the contractor to the service tax authorities, relating to previous RA bill, has to be produced from the second running bill onwards

6.27.0 **TAXES , DUTIES, LEVIES**

6.27.1 Refer To clause 2.8.4 of General Conditions of Contract in this regard. Except service tax and new levies / taxes imposed by Govt during execution period.

6.27.2 New levies / Taxes

6.27.2.1 Incase the Government imposes any new levy / Tax after award of the work, BHEL shall reimburse the same at actual's on submission of documentary proof of payment subject to the satisfaction of BHEL that such new levy / tax is applicable to this contract . No reimbursement on account of increase in the rate of existing levies shall be made.

6.28.0 MANPOWER REQUIREMENT

Manpower requirement for Erection and Commissioning shall as follows:

1. There shall be a Resident manager as Site In Charge at site, under whom there shall be 2 erection engineers for each unit who shall be in charge of ESP and VF.

2. Each area engineer shall be provided with minimum four supervisors and adequate number of Technicians/electricians and other erection staff and T&P etc. The testing Engineers/supervisors/electricians shall be identified separately for each package and the minimum requirement shall be as indicated. Besides, there shall be separate engineers for Planning, Safety and Quality.
3. The Site in charge shall be provided with PCs and good communication facilities like telephone, fax, email etc. at the cost and expense of the contractor. Lack of communication facilities will not be an excuse for extension of completion date.
4. All instructions from BHEL/Customer will be directed to the contractor through the Site in-Charge and he shall be responsible for all the contractor's activities at site. The contractor shall name his authorized representative prior to or immediately on commencement of operations at site
5. The Site In charge shall be present at site during all normal working hours and his contact address after normal working hours shall be made available to BHEL so that if any emergency arises, the presence of the contractor's site Representative at site can be called for.
6. The contractor shall not change the site Representative without the consent of BHEL. Should BHEL require the replacement of the contractor's site Representative for justifiable reasons (including inadequate progress of work) the contractor shall ensure that replacement is made as soon as possible and work is not allowed to suffer delay on this account.

7. The contractor shall provide to the satisfaction of BHEL sufficient and qualified staff for the execution of works. If and whenever any of the contractor's staff is found guilty of any misconduct or be incompetent or insufficiently qualified in the performance of his duties the contractor shall remove them from site as directed by Site Engineer.
8. The contractor shall ensure that all his supervisor's staff and workmen conduct themselves in a proper manner. They shall all be persons who are familiar with and skilled at the jobs allocated to them. Any misconduct / inefficiency noted on the part of the contractor's personnel shall be brought to the attention of the contractor's site representative who shall immediately take such action as necessary including the removal of such misconducting / inefficient persons, if so required by the Engineer-in-Charge.
9. The contractor shall ensure that replacement for such persons removed from site are provided immediately and the work is not allowed to suffer delay on that account.

6.29.0 DETAILS TO BE FURNISHED BY THE TENDERERS

Apart from other details called for in the tender document under the various other provisions, the following details shall be submitted by the tenderers along with their offers. Please also refer the check list.

1. HQ Organization chart
2. Site Organization Chart Covering various function
3. Month wise Manpower deployment plan
4. T&P deployment plan
5. Erection Schedule.
6. Field Quality Plan
7. A copy of Electrical license

Tenderers shall go through very carefully all the provisions under section VI and shall submit manpower deployment plan as per appendix VI A. The list of T&P and instruments that are available with him for mobilization for the work, as specified in Appendix VI B, shall also be submitted by the contractor along with his offer. Tenderers shall indicate the present location and submit a schedule of tools and plants for this site to meet the schedules of erection and commissioning.

6.30.0 **DOCUMENTATION**

1. The following information shall be furnished within two weeks of award of contract for purchaser's approval :
   a. Final field quality plan
   b. Bar chart covering planned activities at site
   c. Detailed organization chart
2. The following information shall be furnished after testing and inspection :
   a. Test certificates of various tests conducted at site.
   b. As built drawings:After successful completion, testing and commissioning of installation work, the above listed Purchaser's drawings/documents shall be updated in line with the actual work carried out and as built drawings/documents shall be submitted by the contractor as agreed for the project.

6.31.0 TOOLS AND PLANT TO BE ARRANGED BY THE CONTRACTOR

1. Equipment, vehicles, tools and plants and materials brought to site by the contractor from his resources shall have distinctive identification marks and the description and quantity shall be intimated to BHEL in writing by the contractor.
2. All construction materials brought by the contractor shall have prior approval regarding quality and quantity by BHEL. The contractor shall also provide without extra cost necessary enclosures containers and protective materials for proper storage of materials inside, whenever so instructed by the purchaser without any extra cost.
3. No material or equipment or tools etc. shall be taken out of the work-site without the written consent of BHEL.
4. BHEL shall not be responsible for the safety and protection of the materials of the contractor and the contractor shall make his arrangements for proper watch and ward for his materials. Until such time the work is taken over by BHEL, the contractor shall be responsible for proper protection including proper fencing, guarding, lighting, flagging, watching. The contractor shall during the progress of work properly cover up and protect any part of the work liable to damage by exposure to the weather and shall take every reasonable precaution against accident or damage to the work from any cause

6.32.0 EQUIPMENT FOR TESTING & COMMISSIONING:

The following testing equipment/T&P shall be brought to site by contractor in sufficient number to carryout the job simultaneously in more than one area.

a) Insulation tester :
   i) Motorised megger - 0 - 1000 - 2000 - 5000V, 0 - 25000 M ohms
   ii) Hand operated megger - 0.5 KV/1.0 KV/2.5 KV, 200 - 100 M ohm

b) Earth resistance tester 0 to 1, 10, 100 ohms

d) Torque wrench

e) Voltmeter ac 0 - 125 - 250 - 625 V ac

f) Ammeter ac 0 - 2A - 10A ac.

g) Wattmeter - ac/dc - 0 - 125 - 250 V 0-5-10A.

h) Multimeter - analogue :acV 2.5V - 2500V, ac A - 100 mA - 10 A
dc V 25.V - 2500V, dc A - 50mA - 10A
Resistance - 0 - 200 M ohms
digital : voltages ac & dc - 100mv - 1000 V
current 10-mA - 10A Resistance - 0-20 M ohms

i) Variac - 1 phase - 5A, 15A 3 phase - 10A, 20A.

j) Secondary injection kit - 0-5A.

k) HV Test kit - 50 KV AC 400kVA.

l) Wheat stone bridge - 0.05 m ohm - 100 ohm.

m) Oscilloscope

n) Air compressor.

o) Oil filtering machine of 2000 LPH capacity.

p) Phase sequence meter - 110V - 450V - 25 to 65Hz.

q) Frequency meter - 0 - 115 - 230 - 4500 - 45 - 601/s.

r) Tong tester - 0 - 5A - 10A, 30A, 60A, 150A - 600A, 500A-1000A.

s) Tachometer etc.

t) mA Source

u) Temperature oil bath

v) Ferrules printer

w) Micro ohm meter for contact resistance measurement of circuit breakers

x) Event recorder for measurement of closing and opening times at micro second accuracy.

6.33.0 ACCURACY REQUIREMENT OF TESTING INSTRUMENTS

Sl. No	INSTRUMENT / TOOL	RANGE	ACCURACY
1	Power Pack	0 to 50V DC, 3A	$\pm$ 2%
2	Analog Multimeter	Voltage 2.5 to 2500V AC	$\pm$ 1.0%
		Current 100 mA to 10A AC	$\pm$ 2.0%
		Current 250 micro A to 1A DC	$\pm$ 1.5%
		Resistance upto 100 ohms	$\pm$ 3.0%
		Voltage 2.5V to 2500V DC	$\pm$ 1%
3	Digital Multimeter	Voltage 200mV to 1000 V DC	$\pm$ 1% + 1 digit
		Philips Voltage 200mV to 1000 V AC	$\pm$ 1% + 1 digit
		Hcl Current 200mA to 20 A AC	$\pm$ 0.8% + 1 digit
		Philips Current 20 mA to 20 A AC	$\pm$ 0.8% + 1 digit

Sl. No	INSTRUMENT / TOOL	RANGE	ACCURACY
		Resistance (Hcl) 2120 200* to 200M*	± 0.5% + 1 digit
		Resistance (Hcl) 2105 200* to 200M*	± 0.25% + 1 digit
		Hcl Voltage 200mA to 750 V	± 0.8% + 1 digit
		Philips Current 20 mA to 20 A DC	± 0.5% + 1 digit
		Hcl Current 200 mA to 010 A AC	± 1% + 1 digit
4	Vibration Measuring Equipments	Velocity upto 50 mm/sec.	± 0.5% mm/sec
		Displacement upto 300 microns	± 2 microns
5	Secondary Injection Kit	Upto 5A	± 0.5mA
6	Motor operated Megger	Upto 200 Ohms	± 5% at Centre scale
7	Tongue tester	0/300/600A AC	± 5%
		0 to 300A DC	± 5%
8	Tachometer (Hand held	0 to 4000 rpm	± 5%
9	Phase Sequence Meter		N/A
10	Three Phase Variac	15 A Capacity	N/A
11	Feeler gauges	300 mm long and 100 mm long	± 2 microns
12	Dial gauges	Q	± 0.01 mm
13	Hand operated Megger 500 V / 1000V	Upto 200 M Ohms	± 5% at Centre Scale ± 10% at end of Scale
14	Motorised Megger 2.5 KV	Upto 200 M Ohms	± 5% at Centre Scale ± 10% at end of

Sl. No	INSTRUMENT / TOOL	RANGE	ACCURACY
			Scale
15	Earth Megger (Tester)	0 to 1, 10, 100 Ohms	± 5% at Centre Scale range
16	AC tongue Tester	0 to 300A AC	± 3%
17	DC Tongue Tester	0 to 300A DC	± 5%
18	High Voltage test Kit	Upto 50 KV AC	± 10%
		Upto 70 KV DC	± 10%
19	Tacho Generator (Mech)	0 to 4000 rpm	± 0.25%
20	DC Ammeter	0 to 300 A	± 10%
21	DC Voltmeter	0 to 500 V	± 10%

Note for Contractors' Instruments

a. The contractor shall arrange all the above. T&P, equipment and instruments as indicated except testing instruments which are proprietary in nature.

b. The contractor at his cost shall arrange all cranes and truck/tractor, trailers required for material handling purpose and also cranes required for erection. If contractor requires any equipments other than what is mentioned as free issues from BHEL same can be hired from BHEL on chargeable basis subject to availability.

c. Any other tools and plants instruments and equipment required in addition to the above for the successful completion of this job will have to be arranged by the contractor at his cost.

d. Necessary accessories for the above shall also be provided by the contractor.

e. The above instruments/equipment will be sent for testing and calibration wherever from time to time and maintained by contractor as required by BHEL.

f. All testing instruments shall have calibration certificate issued by recognized/accredited agencies.

g. List of such agencies and periodicity of calibration required for different instruments will be furnished by BHEL at site.

h. Contractor shall maintain calibration records as per the format CP:FE:FOZ enclosed in the Tender Specification and produce them whenever called for by BHEL Engineers.

i. Contractors shall arrange experienced/qualified persons for using these calibration instruments at laboratory and also at work spot.

j. Wherever frequent calibration is required, contractor shall arrange adequate number of instruments such that the work does not suffer for want of test instruments.

6.34.0 TECHNICAL REQUIREMENTS FOR SUPPLY ITEMS AS APPLICABLE.

1. CABLE LUGS:

a)	Type:	Solderless crimping type
b)	Material	Copper / Aluminium
c)	Whether tinning required (For copper cable lugs)	Yes.
d)	Thickness of tinning:	10 microns
e)	Applicable Standard for LT Cables	IS:8309

2. FERRULES:

a) Colour of ferrules: Yellow/White

b) Colour of engraving Black

3. TAGS:

a) Material : Al/Fiberglass/ Stainless Steel

b) Markings: Engraving/Embossing/Printing

APPENDIX - VI A

MONTHWISE MANPOWER DEPLOYMENT (NUMBER TO BE INDICATED CATEGORYWISE IN EACH MONTH) BY THE CONTRACTOR

S.NO	CATEGORY	MONTHS 1 2 3 4 5 6 7 8 AND SO ON .....
01	Resident Manager	
02	Engineers	
03	Supervisors	
	a. Mechanical	
	b. Electrical	
	c. Industrial Relations/ Safety	
04	Riggers	
05	Fitters	
06	Structure Welders	
07	Electricians	
08	Store Keeper	
09	Semi skilled and unskilled workers	
10	Watchman/Security	

N O T E

01. Minimum Number of persons to be indicated month wise.

02. Above deployment plan will be discussed with BHEL Site Engineer and necessary changes will have to be made by the contractor as per discussion. If required, any additional deployment during execution of the work will have to be arranged by the contractor for meeting various schedules/targets set by BHEL without any additional compensation.

03. Resident Engineer and Engineers should have a minimum qualification of Engineering Degree or Diploma in Engineering with 15 years of experience in Thermal Power Station.

04. Supervisor should have a minimum qualification of Diploma in Engineering or a graduate with 10 to 15 years of experience in Thermal Power Station.

05. Electrician/Technicians should have experience in Thermal Power Stations.

APPENDIX - VI B

DEPLOYMENT PLAN FOR MAJOR TOOLS AND PLANTS / INSTRUMENTS

(MONTH WISE QUANTITY TO BE INDICATED CATEGORYWISE BY THE CONTRACTOR

S.NO	**CATEGORY**	MONTHS 1 2 3 4 5 6 & SO ON	PRESENT LOCATION
01	**Welding Transformer**		
02	Insulation Tester a. Motorised Megger 1000 & 5000 V Grade b. Hand operated Megger 500 & 1000 V Grade		
03	Earth resistance Megger		
04	Torque wrench		
05	Volt Meter/Ammeter/ Avometer/other instrument		
06	Multimeter/Test lamps/ Field telephone sets/ different gauges		
07	3 phase/Single phase Variac 15 Amps		
08	Primary and Secondary Injection testing kits.		
09	HV test kit		
10	Resistance measurement unit		
11	Oscilloscope		
12	5 Amps DC Power Supply unit		
13	Crimping Tools with various sizes of dyes.		
14	Oil filtering machine		

NOTE

01. The list of Tools and other plants to be deployed for this project may be indicated by the tenderers separately.

02. Above deployment plan will be discussed with the site engineer and necessary changes will have to be made by the contractor as per discussions. If required, an additional deployment during execution of work will have to be made by the contractor for meeting various schedules/targets set by BHEL without any additional compensation.

BHEL PS:SR **Format No. CP: FEX**

CALIBRATION RECORD OF SUB-CONTRACTOR'S INSTRUMENTS

Name of Site :

Name of Sub-contractor :

Sl.No.	NAME OF INSTRUMENT	INSTRUMENT REGN. NO.	DATE OF		PERIODICITY OF CALIBRATION	CALIBRATION DETAILS
			ENTRY	EXIT		DATE OF CAL. CAL. AGENCY NEXT DUE DATE DATE OF CAL. CAL. AGENCY NEXT DUE DATE DATE OF CAL. CAL. AGENCY NEXT DUE DATE

SIGN OF SITE CIC

SECTION VII

SIPAT UNITS 4 & 5 (2 X 500 MW)

TECHNICAL REQUIREMENTS AND GUIDELINES FOR INSTALLATION, TESTING, COMMISSIONING AND SUPPLY ITEMS OF HT/LT ELECTRICAL PACKAGES

7.1.0 INSTALLATION, TESTING & COMMISSIONING IN GENERAL:

The stages of completion of various works shall be as follows:

Completion

- Equipment shall considered to be completely erected when the following activities have been completed.
- Moving of all equipment to the respective foundations.
- Fixing of anchor bolts or tack welding as required.
- Leveling and alignment of equipment.
- Assembling of all accessories such as relays, CTs, PTs, meters, instruments etc. as described in the job specification.
- Cable laying, termination with continuity check.
- Applying of finishing coat of paint.

All the equipment shall be tested at site to know their condition and to prove suitability for required performance. The site tests and acceptance tests to be performed by contractor are detailed below.

The contractor shall be responsible for satisfactorily working of complete integrated system and guaranteed performance.

7.2.0 SITE TESTS AND CHECKS

a) General

All the equipment shall be tested at site to know their condition and to prove suitability for required performance.

The test indicated in following pages shall be conducted after installation. All tools, accessories and required instruments shall have to be arranged by contractor. Any other test which is considered necessary by the manufacturer of the equipment, contractor or mentioned in commissioning manual has to be conducted at site.

In addition to tests on individual equipment some tests/checks are to be conducted /observed from overall system point of view. Such checks are highlighted under miscellaneous tests but these shall not be limited to as indicated and shall be finalized with consultation of client before charging of the system.

The contractor shall be responsible for satisfactory working of complete integrated system and guaranteed performance.

All checks and tests shall be conducted in the presence of client's representative and test results shall be submitted in six copies to client and one copy to Electrical Inspector. Test results shall be filled in proper Performa.

After clearance from Electrical Inspector system/equipment shall be charged in step by step method.

Based on the test results clear cut observation shall be indicated by testing engineer with regard to suitability for charging of the equipment or reasons for not charging are to be brought by the contractor.

b) Trial Run Test

After the successful test of each equipment as per standard test procedure the entire control system shall be put on trial run test on actual site conditions and operation of the system.

c) Acceptance Test

The acceptance test on the system shall be carried out by the supplier as per mutually agreed test procedures to establish satisfactorily functioning of the system as a whole and each equipment as part of the system.

7.3.0 TRANSFORMERS (AS APPLICABLE FOR ESP & VFD TRANSFORMERS)

7.3.1 INSTALLATION

To ensure that a Transformer will function satisfactorily, it is important that handling, lifting, storing and assembling are carried out with great care and cleanliness by experienced personnel who know the various working operations very well.

7.3.2 INSPECTION

In connection with receiving and unloading at site, and at the final storing place before assembling, the transformers shall be inspected carefully. External visible damages as dents, paint damage etc. may imply that the transformer has been subjected to careless handling during transport and/or re-loading, and a careful investigation is therefore justified.

After the arrival of the material at receiving points, before unloading, the condition of packing and of the visible parts should be checked and possible traces of leaks verified (condenser bushing). If necessary, appropriate statements and claims should be made.

Drums containing oil which have despatched separately should be examined carefully for leaks or any sign of tampering,. All drums are despatched filled up to their capacity and any shortage should be reported.

Check immediately the gas pressure at the arrival. A positive indicates that the tank and the transformer components respectively are tight, and that the active part including the insulation materials is dry.

If there is no positive gas-pressure, transformer should be immediately filled with dry Nitrogen gas at a pressure of 0.17 kg/Cm2 (2.5 psi) without loss of time.

Otherwise, it should be checked if the core isolation is satisfactory and that accessories packed separately have not been damaged during transportation .

7.3.3 UNLOADING

Whenever rollers/trolleys are supplied with transformer, movement of transformer at site is carried out by mounting these rollers/trolleys.

Alternatively for movement of transformer from loading bay to actual site of the equipment, skidding on greased rails etc can also be resorted to.

7.3.4 STORING

Dismantled equipment and components are packed to the protected against normal handling and transport stresses. The instructions for lifting given on the packages, must be complied with to avoid damages.

Goods stored outdoors must not be placed directly on the ground, and should be covered carefully with tarpaulin or similar materials.

Oil drum should be stored in horizontal (lying) position with both the bungs also in horizontal position.

7.3.5 LIFTING

Lifting devices on the transformer tank are dimensioned of lifting of the complete transformer filled with oil. The positioning of the lifting devices, permissible lifting angles, minimum height to crane hook and transformer weight, appear from the OGA drawings. Check at lifting of compete transformer that the lifting wires/ropes are not in contact with bushing or other components on the cover.

For lifting with hydraulic jacks, the transformer is provided with jacking pads dimensioned for lifting of complete transformer filled with oil. The position of the pads appear on the OGA drawings.

7.3.6 CHECK POINTS BEFORE STARTING AND DURING ERECTION

a. Check points before starting erection.

1. Conditions of leads
2. Bracing, clamping of leads
3. Connections
4. Tap changer checks
5. General conditions of insulation
6. Core check that it has not moved in transit.
7. Core-ground; this is checked with the megger after removing earth connection
8. CTs, including the secondary leads and their passage through metal parts
9. Check that shipping frame for bushings have been removed.

10. Check that coil position has not moved in transit

11. Check for dirt, metal swarf, moisture

12. Check that the bushing leads set without being too close to ground or other points of different potential.

b. Check-points during erection:

By means of the part list and the transformer/reactor OGA, the assembling of a fully completed transformer is carried out according to the following instructions. The following precautions are to be taken:

i. Fire-fighting equipment shall be available at the oil-treatment equipment as well as at work on and adjacent to the transformer.

ii. Welding work on or adjacent to the transformer shall be avoided, but if this is not possible, the work shall be supervised by fire-protection personnel.

iii. Smoking on or near the transformer shall not be allowed.

iv. Transformer tank, control cabinet etc, as well as assembling and oil-treatment equipment shall be connected with the permanent earthing system of the station

v. Check that there is no overpressure in the transformer when blanking plates or connection lids are to be opened.

vi. All loose objects, tools, screws, nuts etc.. shall be removed from the transformer cover before opening the connection and blanking lids.

vii. All loose objects (tools, pencils, spectacles etc..) shall be removed from the boiler- suit pockets etc. before starting the work through man holes.

viii. Tools to be used inside the transformer e.g. for tightening of screws-joint-shall be fastened to the wrist or another fixed point by means of cotton tape or string.

ix. Tools with loose sleeves and tools with catches must not be used at work inside the transformer.

x Greatest possible cleanliness shall be observed at work inside the transformer, and at handling of part to be mounted inside the transformer.

xi. Fibrous cleaning materials should not be used as it can deteriorate oil when mixed with it.

xii. All components despatched separately should be cleaned inside and outside before being fitted.

xiii. A Transformer is best protected form damp hazard by circulating warm, dry, de- aerated oil through it until it temperature is 5 C to 10 C above ambient. This should be done before allowing external excess to the interior of the tank. The warm oil should be circulated all the time transformer is open to atmosphere.

xiv. Oil pump & all joints in the oil pipe work should be air tight to avoid entrance of air through leakage joints.

xv. The active part (core and winding) should be exposed to the surrounding air as short time as possible. Open therefore only one blanking plate or connection lid at a time for remounting of bushing, valves etc.

xvi. Objects which-despite all precaution are dropped inside transformer/reator, must absolutely be brought up form the equipment.

xvii. Check that the oxygen content inside the transformer tank is minimum 20% if a person is to enter the tank..

7.3.7 ASSEMBLY

Assembly of wheels Bushing Valves, cooling device, Oil conservator, Pilot Flanges, Blanking plates and accessories like cooling fans, pumps, OLTC and components for supervision and control oil level indicator, flow indicators, gauges, Buchholz

relay, PRV, thermometers etc. are assembled according to leaflet/description valid for the components.

7.3.8 OIL FILLING

The following procedure is recommended.

(i) Close and blank the valve to isolate the conservator from main tank. Fill the oil in transformer under vacuum upto Buchholz level as per instructions given else where.

(ii) After filling the oil in transformer and breaking the vacuum, oil can be filled in the conservator either through reactor or by drain valve.

(iii) Remove the inspection cover (ii) provided on the side of the conservator and check the air cell assuring that it is inflated. The air must remain in fully inflated condition during oil filling operation. If the air cell is found deflated fit the inspection cover and inflate the air cell with dry air/nitrogen gas to 0.035 kg/sq.cm max . A gauge may be put by removing plug. After filling close these connections.

(iv) Remove air release plugs provided on top of the conservator.

(v) Slowly pump the oil through main reactor/drain valve . Temporarily stop filling operation when oil starts coming from opening after ensuring that no air bubbles come out through these air release holes. Fit the two air release plugs.

(vi) Continue oil filling till oil start coming from air release plug stop oil after ensuring that no air bubbles come out. Fit the plug

vii) Now release the air pressure held inside the air cell from point and continue oil filling until magnetic oil gauge indicates 35 deg. C level.

(viii) Remove oil pump and connect air cell to breather from point . Also remove pressure gauge and put plug .

(ix) The system is now properly filled. Air release plugs are fitted in normal operation.

7.3.9 EQUIPMENT FOR OIL-FILLING UNDER VACUUM

(i) High-vacuum 2 storage oil filtration plant provided with thermostat-controlled oil heaters and vacuum-proof hoses with dependent vacuum pumping system for tank evacuation. Capacity:6000 lph

(ii) Oil-storage tanks provided with silica-gel breathers and inlet/outlet valves for oil circulation. Recommended capacity 20KL

(iii) Vacuum gauges provided in filtration plant.

(iv) Equipment for measurement of electric strength (BDV) of oil - 100 kv set.

(v) Equipment for moisture content of oil.

vi) Equipment for measurement of Resistivity and Tan delta at 90 C.

vii) Transparent vacuum-proof tubes for checking of oil-level during oil filling.

ix) Valves, fitting, gaskets etc.

(x) Dry nitrogen cylinders.

7.3.10 COMMISSIONING

Testing after Assembly of the Transformer

After the transformer/has been assembled at site, it shall be tested in order to check that it has not been damaged during transport and assembly to such an extent that its future operation will be at risk. Regarding the performance of the test, refer to the testing method as per standards. The results of the test shall be documented.

COMMISSIONING CHECKS

SL NO DESCRIPTION

1. Breather Silica gel (Blue when dry)
2. Oil in the Breather housing cup.
3. All valves for their correct opening and closing sequence.
4. Oil level in conservator tank.
5. Oil in cooling system.
6. Oil level in bushings.
7. Release air, wherever necessary.
8. Cooling accessories (Pump motors, Fan motors etc.) for direction and O/L setting.
9. Buchholz, oil level indicator, pressure gauges, thermometer, Temp. indicators etc.
10. Neutral earthing.
11. Earth Resistance of Electrodes.
12. Earthing of bushing test tap.
13. Check oil leakage for 24 hrs.
14. Check Auxiliary circuit voltage (415 V)
15. Calibration of OTI/WTI with hot oil.
16. Check Working of WTI/RTD repeaters at control room.
17. IR of core to earth.
18. Die electric strength of oil PPM & Chemical analysis, specific gravity test
19. IR tests on windings to earth and between winding
20. Phase sequence test & vector group check

21. Continuity test
22. No load voltage ratio on all tap position
23. Winding resistance in all taps
24. Tap changing at 415v 3 50 Hz supply in all three phases
25. TAN-DELTA test if quality check list calls for.
26. Dew point check for N2 Gas at the time of oil filling

INSULATION RESISTANCE TEST

Sl.No Description Date Time in Hrs Megger (not IR Value Temp Remarks less than 500 V)

1. Control wiring
2. Tap Changer

a) Motor

b) Control

3.Cooling system

a) Motor Fan

b) Motor pump

c) Control Wiring

4.Main Winding

a) HV/E+:V Not less

b) LV/E+HV+LV than 1000 V

c) HV/IV megger)

d) IV/LV

e) HV/L

Note :-

(1) While checking these values no external, lighting arrestors etc should be in circuit.

(2) Special care should always be taken while meggering the transformer winding to ensure that there is no leakage in the leads.

Oil Characteristics.

Take necessary precaution (regarding rinsing the bottle, cleaning hand, air bubble etc) while withdrawing the samples, Each sample should be free of air bubbles and should not be tested when it is hot. The sample should satisfy IS:1866.

1. Tank Top Sample Bottom Sample
2. Cooling system Top Sample Bottom Sample
3. OLTC Divertor (each phase)

Tests on CT

1.. Ratio
2. Polarity
3. Magnetising current
4. IR Value

Potential Transformer Tests

1. IR test of primary winding by HV megger between windings
2. IR test of secondary winding by LV megger between winding and winding to earth
3. Checking of voltage ratio
4. Verification of terminal markings and polarity
5. Checking of oil level if applicable

6. Checking of continuity and IR values for cables from PT to M

7. Checking tightness of earthing connection.

8. Checking of insulator for cracks

9. Checking output on charging of the system with connected meter

On Load Tap changer

Sl.No	Description	Date	Observation	Remarks
1.	Visual Inspection of equipment.			
2.	Hand operation on II taps.			
3.	Complete wiring of the circuits.			
4.	Limit Switch			
5.	Over running device			
6.	Remote Panel Wiring.			
7.	Overload Device of Driving Motor.			
8.	Local Operation (Electrical)			
9.	Remote Operation (Electrical)			
10.	Tap Position Indicator.			
11.	Step by step contractor			
12.	Out of Step Relay.			

Note

1) While operating the mechanism on Electrical Control, check once again limit switches, step by step contractor, over running device etc. for their actual operation and prove that they are functioning properly.

2) For More details Please refer Respective Manuals.

7.4.0 GUIDELINES FOR ERECTION OF HT SWITCHGEAR PANELS

7.4.1 Erection

The base frames will be supplied normally along with the boards. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not available, the same will have to be fabricated and painted at site. Base frames shall be grouted on the openings which shall be made on the floor during the time of casting. All necessary concrete chipping and finishing works are to be completed.

7.4.2 All the panels/board shall be placed on its foundation or supporting structures and shall be assembled as required. All panels should be installed with parallel, horizontal and vertical alignment by skilled craftsmen.

7.4.3 All the boards will be delivered in sections. Necessary interconnection of busbar, bolting of panels, left out panel/interpanel wiring, etc. will have to be done after assembling the panel.

7.4.4 THE FOLLOWING POINTS SHALL BE CHECKED UP DURING ERECTION

1. Layout of foundation channels.
2. Floor level covered by the panel with respect to main floor level.
3. Location and serial no. of panels.
4. Positioning of panels.
5. Verticality of switchgear panels within the limit specified.
6. Freeness of Breaker Truck and modules in housing and its manual operation.
7. Earthing of panels and breaker truck to station earth.

8. Lugs for termination of HT and LT cables.

9. Mounting and fixing arrangements of Bus bars.

10. Tightening of Busbar jointing bolts as specified.

11. Clearance between :

    i. Phase to Phase

    ii. Phase to earth

12. Minimum clearance for :

    i. Breaker, Truck and moduls withdrawal

    ii. Distance required for maintenance work

13. Check the operation of :

    i. Remote control

    ii. Various required - closing / tripping / alarm / indications / interlocks

14. Installation position of insts and relays

    Operation of relays and meters by secondary injection.

15. AC/DC supplies for panel

    Final relay settings as per customer requirements.

16. Tightness of terminal connections for HT & LT connections.

17. Opening operation of breaker, manually and electrically.

18. Working of ammeters and voltmeters for their entire range and other panel mounted insts like recorder, indicator etc.

7.4.5 HT SWITCHGEAR TESTS

1. IR test

2. HV one minute P.F. test checking of oil level

3. Measurement of contact resistance for HT breakers
4. Test to prove inter changeability of similar parts (including breaker module)
5. Testing of relays as per supplier's commissioning manual
6. Testing and calibration of all meters.
7. Operation of all relays by secondary injection method
8. Testing of CT polarities and CT ratio by primary injection test.
9. Measurement of kneepoint voltage and secondary resistance for CTs used for differential protection.'
10. IR and voltage ratio test for PTs
11. Functional test of all circuit components for each panel / feeder.
12. Test to prove closing/tripping operation at minimum and maximum specified voltage in test and service position.
13. Check for drawout test and service position of breakers for all feeders.
14. Check for covering of all openings in the panel - check for continuity and operation of aux. contacts of breaker.
15. HV test on vacuum interrupters (for VCBs)
16. Check for pressure of SF6 gas and air (for SF6).

7.5.0 LT SWITCHGEAR PANELS

1. Erection

1.1 The base frames will be supplied normally along with the boards. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not available, the same will have to be fabricated and painted at site. Base frames shall be grouted on the openings

which shall be made on the floor during the time of casting. All necessary concrete chipping and finishing works are to be completed.

1.2 All the panels/board shall be placed on its foundation or supporting structures and shall be assembled as required. All panels should be installed with parallel, horizontal and vertical alignment by skilled craftsmen

1.3 All the boards will be delivered in sections. Necessary interconnection of busbar, bolting of panels, left out panel/interpanel wiring, etc. will have to be done after assembling the panel.

2. Checks during erection

12. Layout of foundation channels.
13. Floor level covered by the panel with respect to main floor level.
14. Location and serial no. of panels.
15. Positioning of panels.
16. Verticality of switchgear panels within the limit specified.
17. Freeness of Breaker Truck and modules in housing and its manual operation.
18. Earthing of panels and breaker truck to station earth.
19. Lugs for termination of LT cables.
20. Mounting and fixing arrangements of Bus bars.
21. Tightening of Busbar jointing bolts as specified.
22. Clearance between :
    iii. Phase to Phase
    iv. Phase to earth
12. Minimum clearance for :

i. Breaker, Truck and moduls withdrawal

ii. Distance required for maintenance work

13. Check the operation of :

i. Remote control

ii. Various required - closing / tripping / alarm / indications / interlocks

14. Installation position of insts and relays

Operation of relays and meters by secondary injection.

15. AC/DC supplies for panel

Final relay settings as per customer requirements.

16. Tightness of terminal connections for HT & LT connections.

17. Opening operation of breaker, manually and electrically.

18. Working of ammeters and voltmeters for their entire range and other panel mounted insts like recorder, indicator etc.

3 LT Switchgear tests

1. IR test
2. Measurement of contact resistance for LT breakers
3. Test to prove inter changeability of similar parts (including breaker module
4. Testing of relays as per supplier's commissioning manual.
5. Testing and calibration of all meters.
6. Operation of all relays by secondary injection method.
7. Testing of CT polarities and CT ratio by primary injection test.
8. Measurement of kneepoint voltage and secondary resistance for CTs used for differential protection

9. IR and voltage ratio test for PTs
10. Functional test of all circuit components for each panel / feeder
11. Test to prove closing/tripping operation at minimum and maximum specified voltage in test and service position
12. Check for drawout test and service position of breakers for all feeders
13. Check for covering of all openings in the panel - check for continuity and operation of aux. contacts of breaker.

7.6.0 GUIDELINES FOR CABLE LAYING

1 In the plant building, substations, switchgear rooms, control rooms etc. Power and control cables shall generally be laid on cable trays installed in concrete trenches, tunnels, cable basements, cable vaults, cable shafts or along building and structures as the case may be.

2 In case of multicore cables of diameter upto 20 mm where not more than 3 cables are taken in one run, these can be taken directly along structures, walkways, platforms, galleries, walls, ceiling etc. by proper clamping at regular intervals of more than 300 mm.

3 Power & control cables installed along buildings and structures, ceilings, walls, etc. which are required to be protected against mechanical damage shall be taken in G.I. conduits.

4 GI conduits shall also be used for flameproof installations, wherever required, with sealing at both ends

5 In corrosive atmosphere, where 1100 V grade cables are required to be taken in pipes, rigid heavy duty PVC pipes shall be provided**.**

6 Entry of cables through trenches/tunnels into buildings shall be by means of one of the methods indicated in drawing as applicable for different buildings.

7 Cables laid exposed in racks/trays and routed through trenches/tunnels/basements etc. to individual drive/control devices etc. shall be taken in embedded surface exposed rigid GI conduits and or flexible conduits unless directly terminated to the equipment in the panels located, above trenches, tunnels or basement.

8 All cables routed along walls or in equipment rooms shall be protected by means of laying them through GI pipes or by providing sheet metal covers upto a height of 2000 mm from the working floor levels and platforms, for protection against mechanical damage. All vertical risers shall be of enclosed type.

9 Tray covers shall not be provided for the cable trays within trenches, tunnels and basements. Non-perforated type sheet steel covers shall be provided for the trays in the areas susceptible to accumulation of coal dust/atmospheric abuses etc.

10 Cable trays shall be supported on ISA 50x50x6mm MS/Gi brackets. Brackets shall be welded to steel plate inserts in the trenches/tunnels or supporting channel angle/inserts in other areas.

11 Wherever direct heat radiation exists, heat isolating barriers (subject to customers approval), for cabling system shall be adopted.

12 For 415V power wiring in ancillary buildings, offices and laboratories, cables shall be taken through embedded/exposed GI conduits or rigid PVC pipes as applicable.

13 If required, a few number of cables in exceptional areas may be directly buried into the earth.

14 Wherever cables are to be laid below roads and railway tracks, the same shall be taken through ducts buried at a suitable depth as decided by Engineers.

15 At certain places where hazardous fumes/gases may cause fire to the cables, cable trenches after installation of cables may be sand-filled.

16 In corrosive atmosphere, PVC conduits shall be used for cables.

17 Single core cables, when pulled individually shall be taken through PVC pipes only.

18 Laying and installation of power, control and special cables shall generally conform to IS : 1255

19 The cables shall be laid-out in proper direction from the cable drums (opposite to the normal direction of rotation for transportation).

20 In case of higher size cables, the laid out cables shall run over rollers placed at close intervals and finally transferred carefully on the racks/trays. Care shall be taken so that kinks and twists or any mechanical damage does not occur to cables. Only approved cable pulling grips or other devices shall be used. Under no circumstances cables shall be dragged on ground or along structure while paying out from cable drums, carrying to site and straightening for laying purpose.

21 Suitable extra length of cables shall be provided for all feeders for any future contingency, in consultation with Engineer.

22 Cable runs shall be uniformly spaced, properly supported and protected in an approved manner. All bends in runs shall be well defined and made with due consideration to avoid sharp bending and kinking of cable. The bending radius of various types of cables shall not be less than those specified by cable manufacturers and that specified in IS 1255.

23 All cables shall be provided with identification tags indicating the cable numbers in accordance with the cable circuit schedule. Tags shall be fixed at both ends of cables (both inside & outside of panel) both sides of floor/wall crossings, every 25m spacing for straight runs or as specified by Engineer for easy identification of cable.

24 When a cable passes through a wall, cable number tags shall be fixed on both sides of the wall.

25 Single core cables for AC Circuits shall form a complete circuit in trefoil formation supported by means of trefoil clamps of non-magnetic material.

26 Multi-core cables above 1100 V grade shall be generally laid in ladder type trays in one layer with spacing not less than one cable diameter of bigger diameter cable.

27 All 1100 V grade multicore power cables and single core DC cables shall be placed in single layer, touching each other and clamped by means of single or multiple galvanised MS saddles/aluminium strips/nylon cable ties. Cables above 35mm diameter shall be clamped individually.

28 Control cables shall be laid touching each other and wherever required may be taken in two layers. All control cables shall be clamped with a common clamp/tie.

29 Segregation of the cables on the basis of their types and their functions shall be as under for horizontal formation:

30 HT cables shall be laid in the top tier(s)

31 LT power cables to be laid in the tray(s) below the HT cable trays.

32 LT control cables to be laid in the Tray(s) next below to the LT power cable (trays)

33 Special control cables including screened control cables to be laid in the bottom most tray(s).

34 For vertical formations, the trays closest to the wall shall be considered as bottom most tray and the order indicated in clause just above shall be followed. However, where there is no clear distinction of bottom/top trays, the order convenient for linking the horizontal and vertical formations shall be followed.

35 When it may not be possible to accommodate the cables as per the criteria indicated in the two clauses indicated above, the following rules shall override the criteria. However, prior approval of the Engineer will be required. In hierarchical order:

36 Control cables are mixed up with the special control cables with clear minimum gap of 100 mm between them.

37 LT power cables are mixed up with control cable with clear minimum gap of 150 mm between them.

38 LT power cables are mixed up with HT power cables with clear minimum gap of 200 mm between them.

39 LT power cables are mixed up with special control cables with clear minimum gap of 200 mm between them.

40 Incase of duplicate feeders to essential loads, the respective cables shall be laid through separate raceways. Alternatively, such cables shall be laid on the opposite sides of a trench/tunnel/basement.

41 For laying cables along building steel structures and technological structures, the cables shall be taken by clamping with MS saddles screwed to the MS flats welded to the structure. MS saddles and flats shall be galvanised.

42 For laying cables along concrete walls, ceilings etc. The cables shall be taken by clamping with MS saddles screwed to the MS flats welded on the inserts. Where inserts are not available the

saddles shall be directly fixed to the walls using raw plus and MS flat spacers of minimum 6 mm thickness.

43 To facilitate pulling of cables in GI conduits, powdered soft stone, plastic scoop or other dry inert lubricant may be used but grease or other material harmful to the cable sheaths shall not be used.

44 No single core cable shall pass through a GI conduit or duct except DC single core cables. AC single core cables shall pass through GT conduits/pipes in trefoil formation only.

45 In case of a 3 phase, 4 wire system, more than one single phase circuit, unless originating from the same phase shall not be taken in the same GI conduit.

46 Entry of cables from underground trenches to the buildings or tunnels shall be by some approved method. Necessary precautions shall be taken to make the entry point fully water tight by properly sealing the pipe sleeves wherever they enter directly into the building at trench level. The sealing shall be by cold setting compound. Any alternative sealing arrangement may be suggested with the offer for consideration by BHEL.

47 Wherever specific cable routes are not shown in cable schedules cables shall be laid as directed by Engineer.

48 SUPPORT SPACINGS & CLAMPINGS

Support spacing and clamping suitably provided and as required

49 LAYING OF CABLES DIRECTLY BURIED IN GROUND

Laying and installation of directly buried cables in ground shall conform to the requirements of IS 1255.

50 SUPPORT SPACINGS & CLAMPINGS

Trefoil Clamps:	
i. Horizontal run spacing :	1000 mm (max)
ii. Vertical run spacing :	1000 mm (max)
iii Axial spacing between adjacent trefoils	Double the diameter of larger cable or 150 mm Whichever is less

Other Clamps

A. Power Cables:

Above 35mm OD

i) Horizontal runs : Individually clamped at 3000 mm Interval (max)

ii) Vertical runs : Individually clamped 3000mm intervals (max).

Upto 35mm OD

i) Horizontal runs : Collectively clamped at 3000 mm intervals (max)

ii) Vertical runs : Collectively clamped at 2000 mm interval (max)

B. Control Cables:

i) Horizontal runs : Collectively clamped at 3000 mm interval (max)

ii) Vertical runs : Collectively clamped at 3000 mm interval (max)

C. Spacing for cables supported along structure/ceiling

Clamping Spacing:

i) In horizontal runs: 750mm (max)

ii) In vertical runs : 750mm (max)

Spacing between cables : 30 mm (min)

Note:

a. Supports shall also be provided at each bend.

b. For any change in above spacing, prior approval of Engineer will be taken

51 CABLE TERMINATION AND JOINTING

1. When the equipment are provided with undrilled gland plates for cable/conduit entry into the equipment, drilling and cutting on the gland plate and any minor modification work required to complete the job shall be carried out at site and drawings shall be prepared and take engineer's approval before drilling holes. Cutting shall not be allowed.
2. Termination of cables shall be done as per termination drawings & interconnection diagrams furnished to the contractor. Looping of cores/wires at terminals as shown in interconnection diagrams is to be done.
3. All cable entries in the equipment shall be sealed after glanding the cables..
4. Adequate length of cables shall be pulled inside the switch boards, control panels, terminal boxes etc. as per near termination of each core/conductor.
5. Power cable terminations shall be carried out in such a manner as to avoid strain on the terminals by providing suitable clamps near the terminals.
6. End sealing/termination of cables shall be done by means specified on the specification for terminations. The system shall be suitable for types of cable specified and complete with stress relief system.

7. Termination and jointing of aluminium/copper conductor power cables shall be done by means of compression method using compression type aluminium/tinned copper lugs.
8. Copper conductor control cables shall be terminated directly into screwed type terminals provided in the equipment. Wherever control cables are to be terminated by means of terminal lugs, the same shall be of tinned copper compression type.
9. Cable joints shall normally be made at an intermediate point in the straight run of the cable only when the length of the run is more than the standard drum length supplied by the cable manufacturer. In such cases, when jointing is unavoidable, the same shall be made by means of specified cable-jointing kit, subject to BHEL's approval of Engineer shall be taken for deciding location of joint.
10. Termination and jointing shall generally conform to the requirements of IS : 1255 and shall strictly conform to the recommendations of termination and jointing kit supplier.

52 TESTING OF CABLES:

1 The contractor shall submit to the Engineer a checklist for testing and commissioning and the activities shall be carried out in accordance with the checklist.

2 Testing and electrical measurement of cable installations shall conform to IS : 1255

3 Prior to installation, cables shall be tested for :

a) Continuity of conductors

b) Insulation resistance between conductors & earth

c) Insulation resistance between conductors.

4 After installation cables shall be tested for :

a) Insulation resistance between conductors & iron

b) Insulation resistance between conductors & earth

c) Conductor resistance

e) Capacitance between conductors & earth (for cables above 7C.1.3KV grade)

f) DC high voltage test (for LT power cables of higher sizes interconnecting PCCs & MCC)

g) Absence of cross phasing

h) Firmness of terminations.

7.7.0 TESTS FOR THE EQUIPMENT ERECTED BY MECHANICAL CONTRACTOR

The tests to be carried out on the equipment at which are normally being erected by Mechanical contractor.

a) Generator :

Generator set with all auxiliaries and controls shall be assembled and tested to verify compliance with the guaranteed technical particulars and for satisfactory performance. Relevant standards shall be followed as guideline fo testing. All the tests shall be witnessed by customer or its representative. The commissioning tests shall be carried out at site under normal service conditions.

Following tests shall be carried out on the generators :

1. Insulation resistance test and determination of polarization index value of:

   –Generator

   –Exciter

   –Resistance temperature detectors

2. Dielectric test

3. No load characteristics

4. Short circuit characteristics

5. Temperature rise at rated voltage, current, power factor and frequency.

6. Over-speed test

7. Calculation of efficiency

8. Phase sequence/voltage balance/current balance checks.

Note :

1. Vibration tests in the factory to be taken at 100% of synchronous speed and at 120% during overspeed test.

2. Vibration test at site to be taken at 100% of synchronous speed of the complete generator with its driver.

9. Instantaneous short circuit test (Optional).

10. Noise measurement test.

11. Response of voltage and frequency with sudden shedding of 25%, 50%, 75% and 100% of rated load respectively.

12. Temperature detector test

13. Measurement of DC resistance of winding

14. Inter turn insulation test of stator winding with induced voltage 130% of rated value for 5 minutes (if applicable).

15. Measurement of shaft voltage.

16 Tan Delta test for generator bushing. (if required).

b) AC Motors

1. IR test of stator and rotor windings.
2. Heating of both windings up to the permissible temp.
3. Checking/testing of associated switchboard, cables, relays/meter interlocking as mentioned in relevant chapters are completed.
4. Tightness of cable connection.
5. Winding resistance measurement of stator and rotor.
6. Checking continuity of winding.
7. Checking tightness of earth connections.
8. Checking space heaters and carryout heating of winding (if required)
9. Checking direction of rotation in decoupled condition during kick start
10. Measurement of no load current for all phases
11. Measurement of temperature of body during no load and load conditions.
12. Check for tripping of motor from local/remote switches and from.
13. Checking of vibration (if required).
14. Checking of noise level (if required)
15. Measurement of stator and bearing temperatures during load running (if applicable) for every half an hour interval till saturation comes.
16. Checking operation of speed switch (if there)
17. Checking of polarisation index of stator winding, R10/R1 by motorised megger (The value should not be less than 2.0) R60/10 absorption coefficient shall not be less than 1.5.
18. Dielectric test.

B)DC Motors

1. IR measurement and heating the winding as per heating curve.
2. Check for earth connection
3. Winding resistance for field and armature.
4. Check running of drive at minimum and maximum specified.
5. Check auto start of drive on failure of AC supply (if applicable)
6. Check operation of overload relay.
7. Measure vibration.
8. Check temperature rise on body of drive after required period of continuous running.
9. Measure load currents and no load currents (if possible)
10. Check direction of rotation.
11. Check continuity of winding.
12. Measurement of RPM.

7.8.0 PAINTING

The surface shall be free from rust, foreign adhering matters, grease etc. Two coats of rust preventing red-oxide primer and final painting of two coats as per the colour decided by the site engineer. (More details please refer Section VI scope of works). After cleaning the surface is painted with one coat of Red oxide zinc chromate primer confirming to IS 2074 and allowed to dry completely. The primer coated surface is painted with two coat of final painting of desired colour which shall be selected from IS-5.

The contractor shall paint steel fabrications at site with two (2) coats of primer followed by two (2) final coats of epoxy paint of shade 631 of IS:5 as detailed in section VI.

7.9.0 CODES AND STANDARDS

7.9.1 All equipment and materials shall be designed, manufactures and tested in accordance with the latest applicable Indian Standards (IS) except where modified and/or supplimented by this specification.

7.9.2 Equipment and materials conforming to any other standard which ensures equal or better quality may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

IS The electrical installation shall meet the requirement of Indian Electricity Rules as amended upto dates, relevant IS codes of Practice and Indian Electricity Act. In addition, other rules or regulations applicable to the work shall be followed. In case of any discrepancy, the more restrictive rule shall be binding. A list of applicable standards is given below for reference.

IS 3043 Code of practice for earthing

IS 3072 Installation and maintenance of switchgear

IS 5133 Box for enclosure of electrical equipment

IS 5216 Guide for safety procedure and practice in electrical work

IS 13947 Degree of protection provided by enclosures for low voltage switchgear and control gear.

IS 5216 Guide for safety procedures and practices in electrical works.

IS 800 Code of practice for use of structural steel

In addition to the standards mentioned above, all works shall conform to the requirements of the following rules and regulations.

a) Indian Electricity Act and Rules framed thereunder

b) Fire insurance regulations

c) Regulations laid down by the Chief Electrical Inspector of State and CEA

d) Regulations laid down by the Factory Inspector of State

e) Any other regulations laid down by the authorities.

In case any clause of contradictory nature arises between standards and this specification, the latter shall prevail.

7.10.0 TECHNICAL REQUIREMENT FOR ITEMS SUPPLIED BY THE CONTRACTOR.

1. GENERAL

Equipment and material supplied shall comply with description, rating, type and size as detailed in this specification, drawings and annexures.

Equipment and materials furnished shall be complete and operative in add details.

All the accessories, fittings, supports, anchor bolts etc., which form part of the equipment or which are necessary for safe and satisfactory installation and operation of the equipment shall be furnished.

All parts shall be made accurately to standard gauges so as to facilitate replacement and repair. All corresponding parts of similar equipment shall be interchangeable.

Samples of all items shall be made available for purchaser's approval prior to supply of item to site.

2 FERRULES

a) Ferrules shall be required for individual core of cable hence they shall be suitable for the insulated conductor diameter.

b) Ferrules shall be of plastic material.

c) Numbering on the ferrules shall be engraved type with contrast colour to the base. Engrave colouring shall be of durable quality to match the entire life of the plant. Engraving shall be legible from a distance of 600 mm.

d) Ferrules shall be interlocking type in such a way that the interlocked ferrules take the shape of tube with complete ferrule number appearing in a straight line.

3 TAGS

a) Cables shall be provided with cable number tags for identification.

b) Cable tags shall be of durable fibre, aluminium or stainless steel sheets.

c) Cable number shall be engraved type in case of aluminium or stainless steel tags, and printed type in case of fibre sheet.

d) Tags shall be durable quality of size 60mm x 12mm with holes at both ends.

e) Samples of tags shall be approved by BHEL Engineer before delivery.

f) Tags shall be provided with non-corrosive wire of sufficient strength for taggings.

4 FIRE STOP CABLE SEALING SYSTEM (AS APPLICABLE)

Fire stop cable sealing system shall have two (2) hours fire protection rating suitable for sealing both vertical & horizontal cable penetrations. The sealing compound in conjunction with mineral wool shall form effective fire seals. The sealing compound shall have special property to allow for short circuit conditions. **GPG fire stop sealing compo** or equivalent sealing compound shall be used.

7,11,0 GUIDELINES FOR ERECTION OF GI PIPES , SUPPORTS AND ACCESSORIES

7.11.1 For installation of cables in GI conduits the conduits shall be installed first without cables but having suitable pull wires laid in conduits.

7.11.2 For equipment and devices having GI conduit entry arrangement other than standard GI conduit adopter, adopters shall be provided as required to enable the GI conduit to be properly terminated, between conduit end and motor T.B.

7.11.3 GI conduits shall run without moisture or water traps and shall be made drawing arrangement towards the end.

7.11.4 The entire GI conduit system shall be firmly fastened in position. All boxes and fittings shall generally be secured independently from the GI pipes entering them.

7.11.5 Bends of GI pipes/conduits shall be made without causing damage to the pipes/conduits.

7.11.6 Occupancy of conduits shall not be greater than 40%.

7.11.7 The adopter for coupling rigid GI pipe/conduits and flexible conduit shall be of aluminium or galvanised steel.

7.11.8 Transportation and storage of cable drums

Transportation and storage of cable drums shall generally conform to the requirements of IS : 1255

7.11.9 All the cables shall be supplied to the contractor free of cost from BHEL/Customer's store/storage area. Transportation of cables from storage area to the work site shall be the responsibility of the contractor.

7.11.10 The cable drums shall be transported on wheels to the place of work.

Note : **The test specified above for all the electrical equipment are not exhaustive. Any other pre-commissioning and field tests not included in the above list but necessary as per relevant standards, Electricity rules, code of practice and instructed by the manufacturer of the equipment shall also have to be carried if deemed necessary shall be carried out as per requirement either at free of cost or at additional cost. Decision of Engineer in charge will be the final regarding additional cost for testing.The contractor shall take the full responsibility of testing, commissioning, trial run and successful operation of the equipment under overall guidance of BHEL engineer**

DATA SHEET

SPECIFIC TECHNICAL REQUIREMENTS

SUPPLY ITEMS

1. Ferrules : As per Section VI

2. Tag

a. Material : Aluminium/Fiber/Stainless Steel

b. Markings : Engraving/Embossing/Printing

c. Size : As required.

3. Cable lugs : Copper/Aluminium (crimping type)

4. Wastage Allowance:

support installation : 1% by weight

SECTION VII

APPENDIX – I

DECLARATION SHEET

I, hereby certify that, all the information and data furnished by me with regard to this Tender Specification No.BHEL:PSSR:SCT:1181 are true and complete to the best of my knowledge. I have gone through the specifications, conditions, stipulations in detail and agree to comply which the requirements and intent specifications.

I further certify that I am duly authorized representative of the under mentioned tenderer and a valid power of Attorney to this effect is also enclosed.

TENDERER'S NAME & ADDRESS

AUTHORISED REPRESENTATIVE'S
SIGNATURE WITH NAME & ADDRESS

SECTION VII

APPENDIX – II

TENDER SPECIFICATION NO BHEL:PSSR:SCT:1181

CERTIFICATE OF DECLARATION FOR CONFIRMING KNOWLEDGE ON SITE CONDITIONS

We,

hereby declare and confirm that we have visited the project site under subject, namely and acquired full knowledge and information about the site conditions. We further confirm that the above information is true and correct and we will not raise any claim of any nature due to lack of knowledge of site conditions.

TENDERER'S NAME AND ADDRESS

Place:

Date :

SIGNATURE OF AUTHORISED
REPRESENTATIVE WITH NAME & ADDRESS:

OFFICE SEAL

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector: Southern Region
474, Anna Salai, Nandanam, Chennai – 600 035.

SECTION VII

APPENDIX - III

CHECK LIST

TENDER SPECTFICATION NO, BHEL: PSSR : SCT : 1181

Tenderers are required to fill in the following details:

1.	a)	Name of the Tenderer with address	:	YES/NO
	b)	Telegraphic/Telex address	:	YES/NO
	c)	Phone (Office/Residence)	:	YES/NO
	d)	Management Structure of firm (Pvt. Ltd/Public Ltd./Partnership/Sole Proprietorship) Documentary proof For the same enclosed)	:	YES/NO
2.		Whether EMD submitted as per Tender specifications terms and Conditions	:	YES/NO
3.		Validity of offer (offer shall be kept open for acceptance for minimum six months)	:	YES/NO
4.		Whether tenderer visited the erection site and acquainted with the site conditions before quoting	:	YES/NO

SIGNATURE OF THE TENDERER

5.	Whether the following details are furnished		:	YES/NO
	a)	Previous Experience	:	YES/NO
	b)	Present assignments	:	YES/NO
	c)	organization chart of the company	:	YES/NO
	d)	Company financial statue	:	YES/NO
	e)	Incase of company, proof of Registration of the company	:	YES/NO
	f)	Memorandum & Articles of Association of company/copy of Partnership deed	:	YES/NO
	g)	Profit & Loss account for the Last 3 years	:	YES/NO
	h)	Audited Balance sheet for the Last 3 years	:	YES/NO
	i)	Income Tax clearance certificate (latest)	:	YES/NO
	j)	Solvency Certificate from a Nationalised Bank	:	YES/NO
	k)	Power of Attorney of the person Signing the tender duly attested By a Notary Public	:	YES/NO
	l)	Manpower organization chart With deployment plan at site For posting of Engineers/super Visitors and workers/labourers For satisfactory completion of Work under this specification	:	YES/NO

SIGNATURE OF THE TENDERER

6.	Whether the Tenderer is conversant with local labour laws & conditions	:	YES/NO
7.	Whether the tenderer is aware of all safety rules and codes	:	YES/NO
8.	Whether the Declaration sheet (as per appendix enclosed	:	YES/NO
9.	Time required for mobilization of of site organization and start of work	:	YES/NO
10.	Whether list of tools and Plants available with the contractor and proposed to be deployed for this work enclosed	:	YES/NO
11.	Whether all the Pages are read understood and signed.	:	YES/NO
12.	Deviations, if any Pointed out	:	
13.	Whether PF exemption No. is allotted by RPFC of your area if so, indicate number	:	YES/NO

SIGNATURE OF THE TENDERER

DETAILED BILL OF MATERIALS FOR ELECTRICAL PACKAGE (HT / LT)

APPENDIX_ IV A

SIPAT : 2 X 500 MW (UNIT 4 & 5)
DETAILED BILL OF MATERIALS FOR HT / LT ELECTRICAL WORKS

BOM Ref No:	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
A.	**BHEL TRICHY SCOPE OF SUPPLY**	Unit 4	Unit 5		
	SG PACKAGE				
A.1.0	**LOW VOLTAGE SWITCH GEAR/ CONTROL PANELS**				6.3.1
A.1.1	SB Local Starter Box Approximate size : 600 x 600 x 300 mm, Weight : 25kg/ panel	132 Nos	132 Nos	264 Nos	6.3.1
A.1.2	SB Local Distribution Board Approximate size : 760 x 760 x 350 mm, Weight : 25kg/ panel	8 Nos	8 Nos	16 Nos	6.3.1
A.1.3	SB Central Distribution Board Approximate size : 15200 x 2250 x 1000 mm, Weight : 1500kg/ panel	1 No	1 No	2 Nos	6.3.1
A.1.4	FTP Local Starter Panel Approximate size : 650 x 1000 x 300 mm, Weight : 25kg/ panel	2 Nos	2 Nos	4 Nos	6.3.1
A.1.5	DC Scan Air fan starter Panel Approximate size : 900 x 1120 x 375 mm, Weight : 50kg/ panel	1 No	1 No	2 Nos	6.3.1

BOM Ref No:	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
A.	**BHEL TRICHY SCOPE OF SUPPLY**	Unit 4	Unit 5		
	SG PACKAGE				
A.2.0	**POWER CABLES, Unarmourred**				6.3.4
A.2.1	3C x 2.5 sqmm, Cu	10000 Mtrs	10000Mtrs	20000 Mtrs	6.3.4
A.2.2	4C x 2.5 sqmm, Cu	1750 Mtrs	1750 Mtrs	3500 Mtrs	6.3.4
A.3.0	**CONTROL CABLES**				6.3.4
A.3.1	5C x 2.5 sqmm, Cu	1750 Mtrs	1750 Mtrs	3500 Mtrs	6.3.4
A.4.0	**TERMINATION OF POWER CABLES**				6.3.4.18
A.4.1	3C x 2.5 sqmm	720 Nos	720 Nos	1440 Nos	6.3.4.18
A.4.2	4C x 2.5 sqmm	90 Nos	90 Nos	180 Nos	6.3.4.18
A.5.0	**CABLE TRAYS, Perforated**				6.3.5
A.5.1	100 mm wide	1000 Nos	1000 Nos	2000 Nos	6.3.5
A.5.2	300 mm wide	500 Nos	500 Nos	1000 Nos	6.3.5

BOM Ref No:	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
A.	**BHEL TRICHY SCOPE OF SUPPLY**	Unit 4	Unit 5		
	SG PACKAGE				
A.6.0	**COMMISSIONING of the following erected by mechanical contractor**				6.3.12
A.6.1	**HT Motors**				6.3.12
A.6.1.1	**11 KV Motors** a. ID fan/ PA fan motors - 4 Nos	4 Nos	4 Nos	8 Nos	6.3.12
A.6.1.2	**3.3.kV Motors** a. FD fan motors - 2 Nos b. Mill motors -10 Nos c. BCW Pump - 3 Nos	15 Nos	15 Nos	30 Nos	6.3.12
A.6.2	LT Motors	65 Nos	65 Nos	130 Nos	6.3.12
A.6.3	LT Motors (Piping Centre Scope)	10 Nos	10 Nos	20 Nos	6.3.12
A.6.4	Hoists	38 Nos	38 Nos	76 Nos	6.3.12

BOM Ref No:	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
A.	**BHEL TRICHY SCOPE OF SUPPLY**	Unit 4	Unit 5		
	AUXILIARY BOILER PACKAGE				
A7.0	**LOW VOLTAGE SWITCH GEAR/ CONTROL PANELS**				6.3.1
A.7.1	**Auxiliary Boiler MCC** Approximate size : 7200 X 1000 X 2500 mm. Weight : 5000 kg	1 No	--------	1 No	6.3.1
A.8.0	**CABLE TRAYS, Perforated**				6.3.5
A.8.1	150 mm wide	250 Mtrs	---------	250 Mtrs	6.3.5
A.9.0	**POWER CABLES, Unarmoured**				6.3.4
A.9.1	3C x 240 sqmm, Al	500 Mtrs	---------	500 Mtrs	6.3.4
A.9.2	3C x 150 sqmm, Al	500 Mtrs	---------	500 Mtrs	6.3.4
A.9.3	3C x 16 sqmm, Al	500 Mtrs	---------	500 Mtrs	6.3.4
A.9.4	3C x 6 sqmm, Al	500 Mtrs	---------	500 Mtrs	6.3.4
A.9.5	3C x 2.5 sqmm, Cu	1500 Mtrs	---------	1500 Mtrs	6.3.4
A.10.0	**CONTROL CABLES**				6.3.4
A.10.1	5C x 1.5 sqmm , Cu	1000 Mtrs	---------	1000 Mtrs	6.3.4
A.10.2	4P x 0.5 sqmm , Cu	400 Mtrs	---------	400 Mtrs	6.3.4

BOM Ref No:	Description	Quantity		Total Qty	Clause Ref No
		2 x 500 MW			
A.	**BHEL TRICHY SCOPE OF SUPPLY**	Unit 4	Unit 5		
	AUXILIARY BOILER PACKAGE				
A.11.0	**TERMINATION OF POWER CABLES**				6.3.4.18
A.11.1	3C x 240 sqmm	4 Nos	----------	4 Nos	6.3.4.18
A.11.2	3C x 150 sqmm	4 Nos	----------	4 Nos	6.3.4.18
A.11.3	3C x 16 sqmm	4 Nos	----------	4 Nos	6.3.4.18
A.11.4	3C x 6 sqmm	8 Nos	----------	8 Nos	6.3.4.18
A.11.5	3C x 2.5 sqmm	8 Nos	----------	8 Nos	6.3.4.18
A.12.0	**COMMISSIONING of the following erected by mechanical contractor**				6.3.12
A.12.1	LT Motors	6 Nos	----------	6 Nos	6.3.12

BOM Ref No	Description	Quantity		Total Qty	Clause Ref No
		2 x 500 MW			
B.	**BHEL - RANIPET SCOPE**	Unit 4	Unit 5		
B.1.0	**ESP CONTROL PANELS**				6.3.1
B.1.1	Auxiliary Control Panel Size : 13000 x 1700 x 2450 mm Approximate Weight : 11000 kg / panel	4 Nos	4 Nos	8 Nos	6.3.1
B.1.2	Electronic Control Panel with BAPCON controller Size : 700 x 650 x 2,000 mm Approximate Weight : 300 kg / panel	80 Nos	80 Nos	160 Nos	6.3.1
B.1.3	IOS panel with stand alone PC with monitor, printers and other accessories etc. Size : 1000 x 500 x 2,050 mm Approximate Weight: 200 kg / panel	1 No	1 No	2 Nos	6.3.1
B.1.4	Rapper Control Panel- with 2 Nos Rapcon controllers Size : 1000 x 500 x 2,050 mm Approximate Weight : 200 kg / Panel	8 Nos	8 Nos	16 Nos	6.3.1
B.1.5	Statcon Panel- with Statcon controllers Size : 1000 x 500 x 2,050 mm Approximate Weight : 200 kg / Panel	4 Nos	4 Nos	8 Nos	6.3.1

BOM Ref No	Description	Quantity		Total Qty	Clause Ref No
		2 x 500 MW			
B.	**BHEL - RANIPET SCOPE**	Unit 4	Unit 5		
B.1.6	Ash level indicator (High & Low), each sets consisting of average length 12 mtrs of 3/4" GI metallic flexible conduit and 12 mtrs length PTFE wire with probes/ Sensors Size of ALI: 900 x 100 x 100 mm; Approximate Weight : 15 kg / ALI	320 Sets*	320 Sets*	640 Sets*	6.3.13
B.2.0	**HEATING ELEMENTS**				6.3.14
B.2.1	Testing and Termination and dressing of Heating Elements for Hopper (Panel Type)	160 sets*	160 sets*	320 sets*	6.3.14
B.2.2	Testing Heating elements for support insulator heater	320 Nos	320 Nos	640 Nos	6.3.14
B.2.3	Testing Heating elements for shaft insulator heater	80 Nos	80 Nos	160 Nos	6.3.14
B.2.4	Testing Thermostats for hopper heaters.	160 Nos	160 Nos	320 Nos	6.3.14
B.2.5	Testing Thermostat for support insulators	8 Nos	8 Nos	16 Nos	6.3.14
B.3.0	**JUNCTION BOXES/ LOCAL START STOP PUSH BUTTONS**				6.3.3
B.3.1	Local Start Stop Push Buttons (for Rapping Motors)	168 Nos	168 Nos	336 Nos	6.3.3

* LUMPSUM RATE TO BE QUOTED PER SET

BOM Ref No	Description	Quantity		Total Qty	Clause Ref No
		2 x 500 MW			
B.	**BHEL - RANIPET SCOPE**	Unit 4	Unit 5		
B.3.2	Junction Boxes for hopper heaters Size: 600 x 278 x 515 mm; Approximate wt: 15kg / JB	160 Nos	160 Nos	320 Nos	6.3.3
B.3.3	Junction Boxes for support insulator heaters,& shaft insulator heaters. Size: 450 x 150 x 300 mm; Approximate wt : 15kg / JB	40 Nos	40 Nos	80 Nos	6.3.3
B.3.4	Junction Boxes for start stop PB ,hopper thermostat, ALI . Size: 250 x 150 x 400 mm; Approximate wt : 12 kg / JB	96 Nos	96 Nos	192 Nos	6.3.3
B.4.0	**LT POWER CABLES (Unarmoured)**				6.3.4
B.4.1	2 C X 120 sq. mm, Al	39000 Mtr	39000 Mtr	78000 Mtr	6.3.4
B.4.2	3 C X 16 sq. mm, Al	2200 Mtr	2200 Mtr	4400 Mtr	6.3.4
B.4.3	3 C X 25 sq. mm, Al	18000 Mtr	18000 Mtr	36000 Mtr	6.3.4
B.4.4	3 C X 70 sq. mm, Al	2500 Mtr	2500 Mtr	5000 Mtr	6.3.4
B.4.5	3 C X 2.5 sq.mm, Copper	44000 Mtr	44000 Mtr	88000 Mtr	6.3.4
B.4.6	2 C X 2.5 sq. mm, Copper	6600 Mtr	6600 Mtr	13200 Mtr	6.3.4

BOM Ref No	Description	Quantity ---------- 2 x 500 MW		Total Qty	Clause Ref No
B.	**BHEL - RANIPET SCOPE**	Unit 4	Unit 5		
B.5.0	**LT CONTROL CABLES (Unarmoured)**				6.3.4
B.5.1	3 C X 1.5 sq.mm, Cu	27000 Mtr	27000 Mtr	54000 Mtr	6.3.4
B.5.2	12 C X 1.5 sq.mm, Cu	31500 Mtr	31500 Mtr	63000 Mtr	6.3.4
B.5.3	14 C X 1.5 sq.mm, Cu	14000 Mtr	14000 Mtr	28000 Mtr	6.3.4
B.5.4	LT screened copper, Unarmoured cable 4C x 1.5 sqmm.	44000 Mtr	44000 Mtr	88000 Mtr	6.3.4
B.6.0	**TERMINATION OF POWER CABLES**				6.3.4.18
B.6.1	2 C X 120 sq. mm, Al	320 Nos	320 Nos	640 Nos	6.3.4.18
B.6.2	3 C X 2. 5 sq.mm, Copper	352 Nos	352 Nos	704 Nos	6.3.4.18
B.6.3	3C x 16 sqmm, Al	16 Nos	16 Nos	32 Nos	6.3.4.18
B.6.4	3C x 25 sqmm, Al	320 Nos	320 Nos	640 Nos	6.3.4.18
B.6.5	3C x 70sqmm, Al	24 Nos	24 Nos	48 Nos	6.3.4.18

BOM Ref No	Description	Quantity ---------- 2 x 500 MW		Total Qty	Clause Ref No
B.	**BHEL - RANIPET SCOPE**	Unit 4	Unit 5		
B.7.0	**PC WITH COLOUR MONITOR**				
B.7.1	Data Logger PC with Colour Monitor along with Printers etc Dimension: 1220 L x 762 D Approximate wt : 10kg	I No	I No	2 Nos	6.3.1.4

BOM Ref No	Description	Quantity		Total Qty	Clause Ref No
		2 x 500 MW			
B.	**BHEL - RANIPET SCOPE**	Unit 4	Unit 5		
B.8.0	**CABLE TRAY SUPPORT AND ACCESSORIES** Flexible GI cable support system, consisting of single/double channels, base plates, cantilever arms as per BOQ given below. The base plate shall be bolted with anchor fasteners for floor mounting and in all other places base plate shall be welded. Necessary 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. Rates shall be accommodated in support channel and cantilever arm erection. Support channels will be supplied in standard running lengths, and shall be cut at site depending on requirement, and exposed metal portion shall be painted as per specification given in section VI. Payment for erection will be made on per metre basis. No separate rate will be paid for cutting & painting. *For Scope of Work, refer Clause 6.3.9*				6.3.7
B.8.1	Base plate for double support channel	900 Nos	900 Nos	1800 Nos	6.3.7
B.8.2	Base plate for single support channel	2700 Nos	2700 Nos	5400 Nos	6.3.7

BOM Ref No	Description	Quantity		Total Qty	Clause Ref No
		2 x 500 MW			
B.	**BHEL - RANIPET SCOPE**	Unit 4	Unit 5		
B.8.3	Double channel support	1800Mtr	1800Mtr	3600 Mtr	6.3.7
B.8.4	Single channel support	1900Mtr	1900Mtr	3800 Mtr	6.3.7
B.8.5	Cantilever arm of length 650 mm	900 Nos	900 Nos	1800 Nos	6.3.7
B.8.6	Cantilever arm of length 500 mm.	850 Nos	850 Nos	1700 Nos	6.3.7
B.8.7	Cantilever arm of length 200 mm.	1400 Nos	1400 Nos	2800 Nos	6.3.7
B.9.0	**GALVANISED CABLE TRAYS complete with accessories like coupler plates ,fastners, clamps etc**				6.3.5
B.9.1	Ladder type 600 mm wide 120mm height	2250Mtr	2250Mtr	4500 Mtr	6.3.5
B.9.2	Ladder type 450 mm wide 120mm height	750Mtr	750Mtr	1500 Mtr	6.3.5
B.9.3	Ladder type 300 mm wide 120mm height	1375Mtr	1375Mtr	2750 Mtr	6.3.5
B.9.4	Ladder type 150 mm wide 120mm height	3125Mtr	3125Mtr	6250 Mtr	6.3.5
B.9.5	Perforated Type, 450 mm wide 120mm height	1250Mtr	1250Mtr	2500 Mtr	6.3.5
B.10.0	**EARTHING MATERIALS**				6.3.8
B.10.1	GI Flat 50 x 6 mm	3000Mtr	3000Mtr	6000 Mtr	6.3.8
B.10.2	GI Flat 30 x 5 mm	4850Mtr	4850Mtr	9700 Mtr	6.3.8
B.10.3	GI wire 8 SWG 4.06 mm dia	900 Kg	900 Kg	1800 Kg	6.3.8

BOM Ref No	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
B.	**BHEL - RANIPET SCOPE**	Unit 4	Unit 5		
B10.4	**STRUCTURAL STEEL for support consisting of ISMC, ISA of different sizes**	10.0 MT	10 .0MT	20.0 MT	6.3.6
B.11.0	**COMMISSIONING of the following erected by Mechanical Contractor**				6.3.2.2
B.11.1	**ESP Transformer** Commissioning of High voltage rectifier transformer – 95 kV, 800mA, – 70kV, 1200mA The scope of work includes oil filtration, sample testing for dielectric strength, PPM etc., calibration of WTI, Bucholz relay etc. Approximate Oil Quantity per transformer: 500 litres *Lump sum rate to be quoted including Final painting*	80 Nos	80 Nos	160 Nos	6.3.2.2
B.11.2	LT Drives of ESP / Ranipet	168 Nos	168 Nos	336 Nos	6.3.12.1
B.11.3	Electrically operated Hoist 3T (EOT)	4 Nos	4 Nos	8 Nos	6.3.12.2

BOM Ref No:	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
C.	**BHEL EDN SCOPE OF SUPPLY**	Unit 4	Unit 5		
C.1.0	**VFD FOR ID FANS**				
C.1.1.1	**DC Air Core Reactor** Floor/channel mounting type 3.6 KV grade, 13 mH, 1000 A rated air cooled DC reactor housed in 3mm thick Aluminium cubicle with suitable input/output terminals Dimension: 2000 x 2000 x 3000 mm , Weight: 2000 kg	4 Nos	4 Nos	8 Nos	6.2.3
C.1.1.2	**LCI Drive Panel** comprising Control and Excitation Panel, Fan and Filter Panel with air duct for exhausting air and Bridge Panel Size: 3700 x 1450 x 2400 mm, in suitable shipping section. Weight: 3000 kg	4 Nos	4 Nos	8 Nos	6.2.3
C.1.1.3	**Common Control Panel** Size: 800 x 1450 x 2400 mm; weight: 400 kg	2 Nos	2 Nos	4 Nos	6.2.3
C.1.1.4	**Adaptor Panel** Size: 600 x 1450 x 2400 mm; weight: 200 kg	4 Nos	4 Nos	8 Nos	6.2.3
C.1.1.5	**O&M Panel** Size: 600 x 600 x 1050 mm; Wt. 100 Kg	1 Nos	1 Nos	2 Nos	6.2.3

BOM Ref No:	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
C.	**BHEL EDN SCOPE OF SUPPLY**	Unit 4	Unit 5		
C.1.0	**VFD FOR ID FANS**				
C.1.1.6	**CLC Panel** Size: 1000 x 1000 x 1450 mm; Wt. 150 Kg	4 Nos	4 Nos	8 Nos	6.2.3
C.1.1.7	**MMI for VFD** Standalone PC with monitor, printer, power distribution box, along with furniture, interconnection power and control cables etc. for all the 4 ChannelsThe scope of work includes installation, integration of the system and testing	1 set*	1 set*	2 sets*	6.2.3
C.1.1.8	**VFD Transformer** 3000KVA, 11/2.3kV, 3ϕ, ONAN, Outdoor type transformer with HV, LV, cable boxes, radiators, conservator tank, marshalling box etc. Overall dimensions: 5000 x 3000 x 3000 mm; Shipping dimensions: 2650 x 1900 x 2375 mm Oil quantity: 3500 litres (approx.) Wt. 9000 Kg (approx.)	4 Nos	4 Nos	8 Nos	6.3.2.1
C.1.1.9	**Vacuum circuit Breaker** 6.6Kv 1250 A ,Indoor , drawout type VCB Size: 1800 x 2400 x 1900 mm; Wt. 1250 Kg	4 Nos	4 Nos	8 Nos	6.2.3

BOM Ref No:	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
C.	**BHEL EDN SCOPE OF SUPPLY**	Unit 4	Unit 5		
C.1.0	**VFD FOR ID FANS**				
C.1.2.0	**LT POWER CABLES, 1.1KV Grade, unarmoured, FRLS, PVC, Al conductor**				6.3.4
C.1.2.1	3C X 25 sq. mm	4200 Mtr	4200 Mtr	8400 Mtr	6.3.4
C.1.2.2	3 C X120 sq. mm	540 Mtr	540 Mtr	1080 Mtr	6.3.4
C.1.3.0	**LT CONTROL CABLES, 1.1KV Grade, unarmoured, FRLS, PVC, Cu conductor**				6.3.4
C.1.3.1	2 C X1.5 sq mm CU cable unarmoured	3400 Mtr	3400 Mtr	6800 Mtr	6.3.4
C.1.3.2	2 C X2.5 sq mm CU cable unarmoured	900 Mtr	900 Mtr	1800 Mtr	6.3.4
C.1.3.3	4 C X1.5 sq mm CU cable unarmoured	320 Mtr	320 Mtr	640 Mtr	6.3.4
C.1.3.4	14 C x 1.5 sq mm CU cable unarmoured	320 Mtr	320 Mtr	640 Mtr	6.3.4
C.1.4.0	**Screened Cables 0.5 sq.mm, 225V grade, FRLS, PVC, Individual Pair & Overall Shielded F Type**				6.3.4
C.1.4.1	2 Pair- 0.5 sq.mm	500 Mtr	500 Mtr	1000 Mtr	6.3.4
C.1.4.2	4 Pair- 0.5 sq.mm	1200 Mtr	1200 Mtr	2400 Mtr	6.3.4
C.1.4.3	12 Pair- 0.5 sq.mm	600 Mtr	600 Mtr	1200 Mtr	6.3.4

BOM Ref No:	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
C.	**BHEL EDN SCOPE OF SUPPLY**	Unit 4	Unit 5		
C.1.0	**VFD FOR ID FANS**				
C.1.5.0	**Screened Cables 0.5 sq.mm, 225V grade, FRLS, PVC, Overall Shielded G Type**				6.3.4
C.1.5.1	2 Pair - 0.5 sq.mm	1300 Mtr	1300 Mtr	2600 Mtr	6.3.4
C.1.5.2	8 Pair- 0.5 sq.mm	960 Mtr	960 Mtr	1920 Mtr	6.3.4
C.1.6.0	**Termination of cables**				
C.1.6.1	3C X 25 sq. mm	12 Nos	12 Nos	24 Nos	6.3.4
C.1.6.2	3 C X120 sq. mm	8 Nos	8 Nos	16 Nos	6.3.4

BOM Ref No:	Description	Quantity --- 2 x 500 MW		Total Qty	Clause Ref No
C.	**BHEL EDN SCOPE OF SUPPLY**	Unit 4	Unit 5		
C.2	**AUTOMATIC VOLTAGE REGULATOR**				6.3.1
C.2.1	**DIGITAL AUTOMATIC VOLTAGE REGULATOR** Digital AVR consists of 1 No. Regulation cubicle, 1 No Thyristor cubicle and 1 No Field suppression cubicle. Overall size : 3050 x 750 x 2295 mm Approximate wt : 1000kg	1 set*	1 set*	2 set*	6.3.1
C.2.2	**POWER CABLES, Unarmoured**				6.3.4
C.2.2.1	3 x 50 sqmm. Cu	300 Mtrs	300 Mtrs	600 Mtrs	6.3.4
C.2.3	**TERMINATION OF POWER CABLES**				6.3.4.18
C.2.3.1	3 x 50 sqmm. Cu	4 Nos	4 Nos	8 Nos	6.3.4.18

* LUMPSUM RATE TO BE QUOTED PER SET

BOM ReD No:	Description	Quantity ---------- 2 x 500 MW		Total Qty	Clause Ref No
D.	**BHEL HYDERABAD SCOPE OF SUPPLY**	Unit 4	Unit 5		
D.1.0	**STARTER CABINET WITH RESISTANCE**				6.3.1
D.1.1	D.C. Starter Cabinet with Resistance box for DC Seal Oil Motor Approximate size of s panel.: 1000 x 800 x 2200 mm; Wt :800 kg Approximate size of resistance box.: 600 x 600 x 500 mm;	2Sets*	2Sets*	4Sets*	6.3.1
D.1.2	D.C. Starter Panels with Resistance Box For EOPs , JOP Approximate size : 800 x 800 x 2280 mm; Wt 800 kg each Approximate size of EOP resistance box.: 1300 x 750 x 850 mm; Approximate size of JOP resistance box: 900 x 500 x 445 mm	4Sets*	4Sets*	8Sets*	6.3.1
D.1.3	Lub Oil Purification Equipment Panel Approximate size: 1000 x 800 x 2280 mm;	1Set*	1Set*	2Sets*	6.3.1

* LUMPSUM RATE TO BE QUOTED PER SET

BOM ReD No:	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
D.	**BHEL HYDERABAD SCOPE OF SUPPLY**	Unit 4	Unit 5		
D.2.0	**COMMISSIONING of the following erected by Mechanical Contractor**				6.3.12
D.2.1	**HT Motors, 11KV** BFP Motor - 1 No CEP Motor - 3 No	4 Nos	4 Nos	8 Nos	6.3.12
D.2.2	**LT Motors**	16 Nos	16 Nos	32 Nos	6.3.12

BOM ReE No	Description	Quantity ---------- 2 x 500 MW		Total Qty	Clause Ref No
.E.	**BHEL - PEM SCOPE**	Unit 4	Unit 5		
	HYDROGEN GENERATION PLANT				
E.1.0	**LOW VOLTAGE SWITCH GEAR/ CONTROL PANELS**				6.3.1
E.1.1	LV switch gear (MCC, ACDB) for H2 plant Size : 5000 x 1000 x 2500 mm Approximate Weight : 4500 kg	1 No	----------	1 No	6.3.1
E.1.2	Local Push Button stations Size : 300 x 200 x 150 mm Approximate Weight : 5 kg / panel	15 Nos	----------	15 Nos	6.3.1
E.2.0	**LT POWER CABLES, Armoured**				6.3.4
E.2.1	3.5C X 95 sqmm, Al	20 Mtrs	----------	20 Mtrs	6.3.4
E.2.2	**Termination** of 3.5C X 95 sqmm, Al cable	4 Nos	----------	4 Nos	6.3.4
E.3.0	**LT CONTROL CABLES, Armoured**				6.3.4
E.3.1	5C X 2.5 sqmm, Cu	1500 Mtrs	----------	1500 Mtrs	6.3.4
E.3.2	14C X 2.5 sqmm, Cu	1500 Mtrs	----------	1500 Mtrs	6.3.4
E.4.0	**LT SCREENED CONTROL CABLES**				6.3.4
E.4.1	4P - 0.5 sqmm	500 Mtrs	----------	500 Mtrs	6.3.4

BOM ReE No	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
.E.	**BHEL - PEM SCOPE**	Unit 4	Unit 5		
	HYDROGEN GENERATION PLANT				
E.4.2	8P - 0.5 sqmm	2000 Mtrs	----------	2000 Mtrs	6.3.4
E.5.0	**LIGHTING PANELS**				6.3.15
E.5.1	ACLDB (12 O/G CKTS) Size : 1850X2200X900 mm Approximate Weight : 500 kg	1 No	----------	1 No	6.3.15
E.5.2	LP-A(12) (12 O/G CKTS) Size : 750X750X250 mm Approximate Weight : 50 kg	1 No	----------	1 No	6.3.15
E.6.0	**FIXTURES**				6.3.15
E.6.1	**FC06** 2x 40W, fluorescent, industrial box type base, and vitreous enamelled side reflectors	9 Nos	----------	9 Nos	6.3.15
E.6.2	**FC02** 2x 40W, fluorescent, industrial box type base, and vitreous enamelled side reflectors	2 Nos	----------	2 Nos	6.3.15
E.6.3	FC26 2X 40W, fluorescent, industrial box type base, and vitreous enamelled side reflectors	9 Nos	----------	9 Nos	6.3.15

BOM ReE No	Description	Quantity ---------- 2 x 500 MW		Total Qty	Clause Ref No
.E.	**BHEL - PEM SCOPE**	Unit 4	Unit 5		
	HYDROGEN GENERATION PLANT				
E6.4	**MW98** 1 X125W, mercury, well glass, flame proof, with vitreous enamelled reflector and cast iron housing	34 Nos	----------	34 Nos	6.3.15
E.6.5	**FC62** 2X 40W, fluorescent, street light with sheet aluminium canopy and ribbed acrylic cover	4 Nos	----------	4 Nos	6.3.15
E.7.0	**RECEPTACLES**				6.3.15
E.7.1	**RA(20A)** 1 ph, 2 pole, 3 pin, porcelain, metal clad, with 20A rotary switch and shrouded plug	6 Nos	----------	6 Nos	6.3.15
E.7.2	**RB(5/15A)** 1 ph, 2 pole, 3 pin, with 15A piano key switch	3 Nos	----------	3 Nos	6.3.15
E7.3	**RC(63A)** 3 ph, 4 pole, 415V, metal clad, with 63A rotary switch and shrouded plug	1 No	----------	1 No	6.3.15

BOM ReE No	Description	Quantity ---------- 2 x 500 MW		Total Qty	Clause Ref No
.E.	**BHEL - PEM SCOPE**	Unit 4	Unit 5		
	HYDROGEN GENERATION PLANT				
E.8.0	**SWITCH BOXES**				6.3.15
E.8.1	**SWB1** switch box with one no. 5A switch and junction box with 4 way stud type terminals [2 nos 10sqmm Al cable]	7 Nos	----------	7 Nos	6.3.15
E.9.0	**JUNCTION BOXES**				6.3.15
E.9.1	**JB-F** outdoor type with 4 way, flame-proof	20 Nos	----------	20 Nos	6.3.15
E.10.0	**CONDUITS (RIGID STEEL HOT DIP GALVANISED)**				6.3.15
E.10.1	20mm, GI conduit	350 Mtrs	----------	350 Mtrs	6.3.15
E11.0	**EPOXY PAINTED CONDUITS**				6.3.15
E.11.1	20 mm	50 Mtrs	----------	50 Mtrs	6.3.15
E.12.0	**20 FLEXIBLE CONDUIT (ELECTROGALVANISED MILD STEEL)**				6.3.15
E.12.1	20 mm dia Flex	50 Mtrs	----------	50 Mtrs	6.3.15
E.13.0	**WIRES**				6.3.15
E.13.1	2.5 sqmm, Cu	125 Mtrs	----------	125 Mtrs	6.3.15

BOM ReE No	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
.E.	**BHEL - PEM SCOPE**	Unit 4	Unit 5		
	HYDROGEN GENERATION PLANT				
E.13.2	4.0 sqmm, Cu	700 Mtrs	----------	700 Mtrs	6.3.15
E.14.0	**CABLE TRAYS**				6.3.5
E.14.1	Ladder type 600 mm wide	200Mtrs	----------	200Mtrs	6.3.5
E.14.2	Ladder type 300 mm wide	200Mtrs	----------	200Mtrs	6.3.5
E.14.3	Perforated type 600 mm wide	100Mtrs	----------	100Mtrs	6.3.5
E.14.4	Perforated type 300 mm wide	150Mtrs	----------	150Mtrs	6.3.5
E.15.0	**CONDUITS**				6.3.5
E.15.1	Galv. MS rigid (75/ 50/ 25 mm dia)	800 Mtrs	----------	800 Mtrs	6.3.5
E.15.2	PVC various dia (19/ 25/ 40/ 75/ 100/ 125/ 150 mm dia)	300 Mtrs	----------	300 Mtrs	6.3.5
E.16.0	**MARSHALLING BOXES**				6.3.15
E.16.1	6 WAY	2 Nos	----------	2 Nos	6.3.15
E.16.2	24 WAY	2 Nos	----------	2 Nos	6.3.15

BOM ReE No	Description	Quantity		Total Qty	Clause Ref No
		2 x 500 MW			
.E.	**BHEL - PEM SCOPE**	Unit 4	Unit 5		
	HYDROGEN GENERATION PLANT				
E.17.0	**ABOVE GROUND EARTHING & LIGHTNING PROTECTION MATERIAL**				6.3.8
E.17.1	GS FLAT 50 X 6 mm	100 Mtrs	----------	100 Mtrs	6.3.8
E.17.2	GS FLAT 35 X 6 mm	100 Mtrs	----------	100 Mtrs	6.3.8
E.17.3	GS FLAT 25 X 3 mm	100 Mtrs	----------	100 Mtrs	6.3.8
E.17.4	GS WIRE 8 SWG	100 Mtrs	----------	100 Mtrs	6.3.8

BOM Ref No:	Description	Quantity ---------- 2 x 500 MW		Total Qty	Clause Ref No
F.	**BHEL HARDWAR SCOPE OF SUPPLY**	Unit 4	Unit 5		
F.1.0	**LOW VOLTAGE SWITCH GEAR/ CONTROL PANELS**				6.3.1
F.1.1	D.C Starter Cabinet with Resistance box for DC seal oil motor Approximate size : 1000 x800 x 2200 mm, Weight : 800kg Approximate size of resistance box: 600 x 600 x 500 mm	132 Sets*	132 Sets*	264 Sets *	6.3.1
F.1.2	DC Jacking oil pump starter panel Approximate size : 1000 x800 x 2200 mm Weight : 800kg/ panel	1 No	1 No	2 Nos	6.3.1
F.1.3	DC Emergency Lub oil pump starter panel Approximate size : 1000 x800 x 2200 mm Weight : 800kg/ panel	2 Nos	2 Nos	4 Nos	6.3.1
F.1.4	Starter Panel for Central oil purification Approximate size : 1000 x800 x 2200 mm Weight : 800kg/ panel	1 Nos	1 Nos	2 Nos	6.3.1

* LUMPSUM RATE TO BE QUOTED PER SET

BOM Ref No:	Description	Quantity 2 x 500 MW		Total Qty	Clause Ref No
F.	**BHEL HARDWAR SCOPE OF SUPPLY**	Unit 4	Unit 5		
F.2.0	**COMMISSIONING of the following erected by Mechanical Contractor**				6.3.12
F.2.1	**500 MW Generator** including H.V. testing, meggering of Bushings & Accessories, resistance measurement, meggering including dry out of generator.	1 No.	1 No.	2 No	6.3.12
F.2.2	Exciter dryer/ heater	1 No	1 No	2 Nos	6.3.12
F.2.3	Generator Air Dryer	1 No	1 No	2 Nos	6.3.12
F.2.4	Exciter Lighting	1 No	1 No	2 Nos	6.3.12
F.2.5	LT Motors	32 Nos	32 Nos	64 Nos	6.3.12