

TENDER SPECIFICATION

BHEL:PSSR:SCT: 1366

FOR

Design of 11 KV /415 V -500 KVA substation and 11 KV Over head Transmission through ACSR Conductors, Erection, Testing, Commissioning ,Operation and maintenance of 8 No. of 500 KVA substations including Supply of RCC / Steel Poles, ACSR conductors, Insulators and other miscellaneous materials for construction power supply and yard lighting for 2 x 500 MW Units

At

**TUTICORIN THERMAL POWER PROJECT
TUTICORIN, TAMILNADU**

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: 1366

Messrs

Date :

Dear Sir,

Sub:

Design of 11 KV /415 V -500 KVA substation and 11 KV Over head Transmission through ACSR Conductors, Erection, Testing, Commissioning, Operation and maintenance of 8 No. of 500 KVA substations including Supply of RCC / Steel Poles, ACSR conductors, Insulators and other miscellaneous materials for construction power supply and yard lighting for 2 x 500 MW Units at Tuticorin Thermal Power Plant , Tuticorin, Tamilnadu

Please find enclosed one set of non-transferable tender documents containing ____ pages of Tender Specification Booklet for the above work.

You are requested to go through the tender documents 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 8.)

The completed quotations shall reach the office of the under signed on or before **05.01.2010** 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

ADDITIONAL GENERAL MANAGER / CONTRACTS

This Tender document is not transferable.

Place : Chennai -35

Encl: One set of Tender documents.

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 Seven years indicating contract value, duration, completion period and present engagement as per G.C.C.
02. Organisation structure of the Company as per General Conditions of Contract (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 Construction 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 REQUIREMENT, AS GIVEN BELOW.

14. QUALIFICATION REQUIREMENT

a) The bidders should have executed 11 KV Sub Station works and associated LT distribution works through Over head line, under ground cable for power plant , Steel Plant , Refineries Plant, Petro Chemical Plant , Cement Factory or any other industrial units equivalent to above plants in the last seven years.

The bidder should have valid "**A**" **Grade** or equivalent contract license issued by State / Central authorities for executing Electrical works at NTPL 2 x 500 MW Tuticorin Project.

b) The bidders should have a minimum average financial turn over of **Rs. 31 Lakhs** per year in the preceding three years ending 31st March 2009.

The Bidder must have earned profit in any one of the last three financial years ending 31.03.2009 and should have positive net worth as on 31.03.2009.

Bidder should submit audited balance sheet and profit & loss account of the company for last three years ending 31.03.2009 in support of above requirement.

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

LD / Penalty shall be leviable as per the applicable clauses of GCC.

15. TENDERERS HAVE TO FURNISH A DECLARATION SHEET INDICATING THAT THERE IS NO DEVIATION FROM THE 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 Govt. of India Undertaking)

Power Sector – Southern Region

EVR Periyar Building

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 Additional 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 , 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 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.

Additional General Manager/Contracts.



Bharat Heavy Electricals Limited

(A Govt. of India Undertaking)

Power Sector – Southern Region

EVR Periyar Building

690 , Anna Salai, Nandanam, Chennai – 600 035.

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: 1366

Description	EMD
Design of 11 KV /415 V -500 KVA substation and 11 KV Over head Transmission through ACSR Conductors, Erection, Testing, Commissioning, Operation and maintenance of 8 No. of 500 KVA substations including Supply of RCC / Steel Poles, ACSR conductors, Insulators and other miscellaneous materials for construction power supply and yard lighting for 2 x 500 MW Units at Tuticorin Thermal Power Plant , Tuticorin, Tamilnadu	Rs.2,00,000/- (Rupees Two Lakhs only)

Cost of Tender Documents : Rs.1040/-
(Including all Taxes)

Sale Starts on : 16.12.2009

Sale closes on : 04.01.2010

Due date and Time for Submission : 05.01.2010

Date and time for opening Of Technical Bids : 05 .01.2010

QUALIFICATION REQUIREMENT

- a) The bidders should have executed 11 KV Sub Station works and associated LT distribution works through Over head line, under ground cable for power plant , Steel Plant , Refineries Plant, Petro Chemical Plant , Cement Factory or any other industrial units equivalent to above plants in the last seven years.

The bidder should have valid " A" Grade or equivalent contract license issued by State / Central authorities for executing Electrical works at NTPL 2 x 500 MW Tuticorin Project.

- b) The bidders should have a minimum average financial turn over of **Rs.31 Lakhs** per year in the preceding three years ending 31st March 2009.

The Bidder must have earned profit in any one of the last three financial years ending 31.03.2009 and should have positive net worth as on 31.03.2009.

Bidder should submit audited balance sheet and profit & loss account of the company for last three years ending 31.03.2009 in support of above requirement.

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

LD / Penalty shall be leviable as per the applicable clauses of GCC.

Interested parties can get the Tender documents from the office of the Additional 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 therefore. **TENDER NOT ACCOMPANIED BY THE PRESCRIBED EARNEST MONEY DEPOSIT ARE LIABLE TO BE SUMMARILY REJECTED.**

Additional General Manager /Contracts

TENDER SPECIFICATION : BHEL:PSSR:SCT:1366

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

Additional 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:1366 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 Lakh 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 Lakh 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

**NTPL 2 X 500 MW – TUTICORIN THERMAL POWER
PROJECT
PROJECT INFORMATION**

1	Project Name	NTPL 2 x 500 MW Tuticorin Thermal Power Project
2	Project Owner	NLC Tamilnadu Power Ltd (NTPL)
3	Elevation above MSL	+3.0 Meter
4	Near by	Existing 5 x 210 MW thermal plant
5	Nearest City	Tuticorin
6	Roads & Highways	All weather road connecting Tuticorin port highway
7	Ambient Temperature	Absolute Max 42°C & Min 15°C
8	Relative Humidity	100%(Max) 36% (Min) 75% Design
9	Annual Rainfall	2540.8 mm (Max) 1175.7 mm (Min)
10	Wind Direction	November to Jan : from NW & NE Feb to March : East & south West June: From SW July to August: From NW Sept to October : from SE & SW
11	Wind Speed	11.8 KMPH (average) 50 m /sec (Max)
12	Earth quake data	Zone III as defined in IS 1893-2002

13	Nearest Airport	Tuticorin at a distance of 35 Km from site
14	Nearest Sea port	Tuticorin port 3 Kms from site
15	Nearest Railway Station	Tuticorin
16	Ambient temperature for Electrical appliances	50°C

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 labour, 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/ till unit is handed over, as specified in detail in relevant clause

3.2 FACILITIES TO BE PROVIDED BY BHEL:

3.2.1 OPEN SPACE :

Open space for building of temporary office shed, contractor's stores shed(s) labour colony will be provided free of charges.

3.2.2 ELECTRICITY:

For construction purpose, and for contractor's office and stores shed, electricity will be provided at one single point free of charge. Further distribution shall be arranged by the contractor, at his cost.

3.2.3 WATER:

Water for construction purpose will be provided at a single point, free of charge, as provided by customer to BHEL nearer to the site. Further distribution shall be arranged by the contractor at his cost. For drinking purpose the contractor has to make his own arrangement at his 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 at his cost.

3.2.5 CONSUMABLES :

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

3.3.0 FACILITIES TO BE PROVIDED AND DEVELOPED BY THE 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 this purpose.

3.3.2 WATER DISTRIBUTION :

Distribution of water for various work fronts from the single point shall be arranged by the contractor at his cost.

3.3.3 ELECTRICITY DISTRIBUTION

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. Any duty, deposit involved in getting the electricity shall be borne by the bidder. As regards contractors office shed also all such expenditure shall be borne by the contractor. Necessary meters for recording consumption of

power for cost calculation purpose and maintenance of the same during execution period shall be contractor's responsibility.

BHEL is not responsible for any loss or damage to the contractors equipment as a result of variations in voltage / frequency or interruptions in power supply. Before connecting any equipment the contractor shall ensure that it is rated for the correct voltage to which it is being connected and the equipment is not likely to cause a fuse blow out.

The contractor shall endeavour to minimize the current consumption as far as possible and avoid wastage.

3.3.4 POSSESSION OF GENERATORS

As there are bound to be interruptions in regular power supply power cut/load shedding in any construction site due to inherent power shortage in State , suitable extension of time if found necessary only be given on this account 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.

3.3.5 LIGHTING FACILITIES

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 REQUIREMENT

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, pipelines, 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

BHEL will undertake such work and the cost of the same will be recovered from the Contractor including overhead charges. The decision of BHEL. Engineer in this regard is final.

3.4.0 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 reason 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.

3.5.0 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 etc. On receipt of the electrodes at site, it shall be subject to inspection and approval of BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry.
- 3.5.2 Storage of electrodes shall be done in an air conditioned / controlled humidity room as per requirement, at his own cost by the contractor.
- 3.5.3 All low hydrogen 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 HP 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 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.

3.6.0 TOOLS & TACKLES

- 3.6.1 All T & P required for the satisfactory execution of work shall be arranged by contractor at his cost except those specifically indicated as provided by BHEL, free of hire charges.
- 3.6.2 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.
- 3.6.3 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.
- 3.6.4 All the T & P arranged by contractor including electrical connections wherein required shall be reliable / proven / tested and necessary test certificate to be submitted as per statutory rules of the State / Central Government in force from time to time.
- 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 his cost.
- 3.6.6 All the tools and tackles required for the complete erection of components shall be arranged by the contractor, except the items specified and agreed upon by BHEL and the quoted rate shall be inclusive of such requirements.

- 3.6.7 The area and infrastructure development of the work area are to be carried out by the customer. However in construction projects of this magnitude it is possible that all the areas / approaches may not be ready. In such cases consolidation of ground and arrangement of sleepers / sand bag filling etc., for safe operation / movement of equipment including cranes/trailers etc shall be the responsibility of the contractor at his cost. No compensation on this account shall be payable.
- 3.6.8 Contractor shall ensure deployment of serviced and healthy T&Ps including cranes, lifting tackles, wire ropes, manila ropes, winches and slings etc., History card and maintenance records for major T&Ps will be maintained by the contractor and will be made available to BHEL Engineer for inspection as and when required. Identification for such T&Ps will be done as per BHEL Engineer's advice.
- 3.6.9 Contractor shall ensure deployment of reliable and calibrated IMTEs (Inspection measuring and testing equipment). The IMTEs shall have test /calibration certificates from authorized / Government approved / accredited agencies traceable to National / International standards. Each IMTE shall have a label indicating calibration status i.e. date of calibration, calibration agency and due date for calibration. A list of such instruments deployed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.
- 3.6.10 Re-testing / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such IMTE so that work does not suffer when the particular instrument is sent for calibration. If any IMTEs not found fit for use, BHEL shall have the right to stop the use of such item. It will be necessary for the contractor to deploy proper item. Any readings taken by the defective instrument will be recalled and repeat the readings taken by that instrument with a proper one. In case he fails to do so, BHEL may deploy IMTEs and retake the readings at contractor's cost.

3.7.0 SUPERVISORY STAFF AND WORKMEN

- 3.7.1 The Contractor shall deploy experienced engineers, supervisors , all the skilled workmen like 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 stores/storage yard to erection site, transportation, erection, testing and commissioning contemplated under this specification. Only fully trained and competent men with previous experience on the job shall be employed. They shall hold valid certificates wherever necessary.

- 3.7.2 The supervisory staff employed by the contractor shall be qualified (Engineers – Graduates in Engineering and Supervisors – Diploma Holders) 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 BHEL's client.
- 3.7.3 The Contractor shall also furnish daily labour report showing by classification the number of employees engaged in various categories of work and a progress report of work as required by BHEL Engineer. The contractor shall also give a summary report at the end of the month and plan of deployment for the subsequent month as per the plan of activities as required by BHEL, to meet the overall contract requirement.
- 3.7.4 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.
- 3.7.5 It is the responsibility of the bidder to engage his workmen in shifts or on overtime basis 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.
- 3.7.6 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 the erected components etc. The contractor shall make the same good at his own expense or in default, BHEL may cause the same to be made 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 CIVIL WORKS

3.8.1 All Civil works for the installation of all equipments including poles will be carried out by the contractor at his cost . This work shall include all work from earth work excavation to providing required concrete or civil foundation including grouting as per BHEL specification. The contractor shall supply all required materials like cement, sand, brick, reinforcement ,etc., required for satisfactory completion of civil works and as per instruction of BHEL Engineer.

3.9.0 SCOPE OF MATERIAL HANDLING AND SITE STORAGE AND OTHER RESPONSIBILITIES – FOR BHEL SUPPLIED MATERIALS .

3.9.1 While BHEL will endeavor to store/stack/identify materials properly in their open/closed storage yard/shed it shall be contractor's responsibility to assist BHEL in identifying materials 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.

3.9.2 It shall be contractor's responsibility to arrange necessary tractors, tailor or trucks / slings / tools and tackles / labour including operators Fuel lubricants etc., for loading from storage yard 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.

3.9.3 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.

3.9.4 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 and maintain records.

3.9.5 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.

- 3.9.6 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 and erection. The history cards for major equipments to be maintained by the contractor.
- 3.9.7 The contractor shall take delivery of equipment from storage yard/stores/sheds. He shall also make arrangements for verification of equipment, scrupulously 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.
- 3.9.8 Sometimes it may become necessary for the contractor to handle certain un-required 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.

3.10.0 PRESERVATION OF COMPONENTS (where Applicable)

- 3.10.1 It shall be the responsibility of the contractor to apply preservative 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 the contractor at his cost.
- 3.10.2 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.
- 3.10.3 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. The required paint and thinner shall be provided by BHEL free of cost. All other consumables like painting brush, emery paper, cotton waste, cloth etc. have to be arranged by the contractor at his 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.

3.11.0 DRAWINGS AND DOCUMENTS

- 3.11.1 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.
- 3.11.2 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. Contractor shall maintain complete records of drawings and documents given to them time to time and maintain the latest drawings / documents in their custody. Contractor shall refrain from defacing the drawing / documents available with them.
- 3.11.3 The data furnished in various appendices 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.
- 3.11.4 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.
- 3.11.5 Deviation from design dimensions should not exceed permissible limit. The contractor shall not correct or alter any dimensions/details without specific approval of BHEL.

3.12.0 SITE CLEANINESS AND SAFETY REQUIREMENTS

3.12.1 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.

3.12.2 Non-conformity of safety rules and safety appliances will be viewed seriously and the BHEL has right to impose fines on the contractor as under.

Sl.No	Safety	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/-

3.12.3 Contractor should exclusively deploy one Qualified safety Engineer (Diploma in Safety) alongwith a safety supervisor for effective implementation and co-ordination of safe working conditions.

3.12.4 Contractor shall necessarily fill up the safety plan format available in General Conditions of Contract

3.13.0 PROGRESS OF WORK

3.13.1 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.

3.13.2 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.

3.13.3 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.

SPECIFIC REQUIREMENTS FOR ISO 9001 - 2000

3.14.0 IMPORTANT NOTE

Contractors shall ensure that all their Staff/Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on ISO 9002 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 contractor 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 contractor for the non-conformances if any, observed and pointed out by BHEL.

3.15.0 INSPECTION / QUALITY ASSURANCE / QUALITY CONTROL STATUTORY INSPECTION

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

3.15.2 All the Electrical/Technical Measuring and Testing Instruments / Gauges, Feeler Gauges, Height 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, Levelling, 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 of BHEL Engineer.

3.16.0 STAGE INSPECTION BY FES / QA ENGINEERS

3.16.1 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. Contractor shall arrange all labour, Tools and Tackles, etc. for such stage inspections free of cost.

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

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

3.16.4 Any major Rectification or Major Repair / Major Rework 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.

3.17.0 STATUTORY INSPECTION

The scope includes getting the Approvals from the statutory authorities (Like Electrical Inspector and Labour Officers). This includes Arranging for Inspection Visits of Inspector Periodically as per BHEL Engineer's Instructions, Submitting Documents, Radiographs, Etc. and following up the matter with them.

All fees connected with the contractors for Testing his Welders/Men / Works and Testing, Inspection, calibrating his instruments and equipments, shall be paid by the contractor. It shall be contractor's 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 be contractor's Account.

However, BHEL shall pay all other Fees (FEES FOR VISITS, INSPECTION FEES, REGISTRATION FEES, ETC.) In case these Inspection 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.

3.18.0 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.

SUB CONTRACTOR TO ENSURE COMPLIANCE OF THE FOLLOWING SAFETY RELATED POINTS

01. Personnel protective equipment (PPES): Required number of following PPES (Confirming to Relevant 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 fulfil required electrical safety aspects as per relevant BIS 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.

SUB CONTRACTOR 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

3.19 OTHER HSE REQUIREMENTS TO BE COMPLIED BY SUB CONTRACTOR

1. Sub contractor to clearly understand and accept the HCE 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.

SECTION - VI

CONSTRUCTION POWER SUPPLY AND YARD ILLUMINATION

SCOPE OF WORKS AND TERMS & CONDITIONS

6.1.0 GENERAL

6.1.1 The scope of construction power supply work will comprise but not limited to the following: The scope of "**Construction Power Supply and Illumination Packages**" work includes Engineering, Supply, Identification of equipment at BHEL storage yard, technical assistance for checking and making the shortage / damage reports, taking delivery at storage yard, erecting, and carrying out statutory tests as required, commissioning and maintenance of the equipments, along with supply of all consumables, tools and tackles and testing instruments.

The required 500 KVA Transformer & Distribution Kiosks and lighting Mast shall be supplied by BHEL free of cost. All other materials shall be supplied by the contractor, unless otherwise specifically indicated as supply by BHEL .The BOQ and rate schedule give the details of the quantum of the work to be executed.

6.1.2 It is not the intent to specify herein all details of equipment and materials. Any item of work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the job.

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

- 6.1.4** 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.
- 6.1.5** Contractor shall supply and erect all items, equipments etc., as per sequence and priority prescribed by BHEL at site. BHEL engineer depending upon the availability of materials and site requirements will decide the priority of erection & methodology. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the usual methods of erection adopted in erection / commissioning of similar jobs.
- 6.1.6** During the course of erection, testing and commissioning of construction power supply work, certain rework or modification may be necessary on account of feedback from other construction sites or on account of maintenance requirements. The contractor shall carry out such rework / modification expeditiously and the same shall be deemed to be part of the scope of work.
- 6.1.7** Contractor shall take delivery of BHEL supplied materials from the storage yard/ sheds of BHEL, which is within the plant boundary area. 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 / commissioned. The contractor shall transports materials to erection site by the prescribed route without disturbing and damaging the other's works in the most professional manner and materials shall be stored in appropriate manner as per BHEL's instructions.
- 6.1.8** 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 will be final and binding on the contractor.

6.1.9 Contractor shall retain all T&P/ testing instrument etc., at site as per advice of BHEL engineer and same shall be taken out from site only after getting clearance from Engineer in charge.

6.1.10 Contractor shall remove all scrap materials periodically generated from his working area in and around power station plant boundary area and collect the same at one place earmarked for the same by BHEL. Failure to collect the scrap is likely to lead to accidents and BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if the contractor fail to clear the scraps. All the package materials, including special transporting frames, etc., shall be returned to the BHEL stores / customer's stores by the contractor.

6.1.11 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.

6.1.12 The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances. The contractor shall co-operate with other contractors and agencies so that various activities can be carried out simultaneously in order to achieve an early completion.

6.1.13 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, testing/ calibrating equipments, etc.,

and also adequate trained, qualified and experienced engineers, supervisory staff and skilled personnel.

6.2.0 SCOPE OF WORK

6.2.1 SCOPE OF WORK IN GENERAL

1. The scope of construction power supply and yard lighting systems shall be as detailed below.
 - a. **Preparation of route survey and layout drawing, 11 KV distribution drawing, obtaining approval from statutory authority for drawing/installation of construction power supply.**
 - b. **Preparation of drawing, supply of required materials, Erection and commissioning and maintenance of 11KV/ 415V sub-stations**
 - c. **Preparation of drawing, supply of required materials, Erection and commissioning and maintenance of 11 KV ring main power distribution systems which shall be hooked up with 9 Nos. substations.**
 - d. **Preparation of route and layout drawing, Supply of required materials, Erection and commissioning and maintenance of Yard Lightings.**
2. The scope of construction power supply covers Supply and Installation of PSC poles, AB switch assembly, drop out HG Fuse, Pin Insulator, Disc Insulator, LA, Earth pits, cable markers, RSJ poles, GI stay (7 / 30 mm) sets with Guy, Bow, Stay Rod, wire etc., Supply and Strings of 7/4.09 ACSR Raccoon Conductor, HT cables, Supply and laying of LT power cable, Fabrication and installation of steel supports and poles, Supply and casting foundation for Kiosk and transformer etc., as detailed in the BOQ,

3. The Yard lighting scope covers Supply and Installation of Light poles, Light Fixtures, Lamps, cables, LDB , earthing materials etc., as detailed in the BOQ.

6.3.0 DETAILED SCOPE OF WORKS – CONSTRUCTION POWER SUPPLY:

6.3.1 PREPARATION OF ROUTE LAYOUT AND DETAILED DRAWINGS

The contractor shall prepare detailed drawings in consultation with site engineers after carrying out the route survey for 11 KV ring main overhead line, below ground transmission through cables wherever overhead lines are not possible, and Substations. These drawings shall be prepared in accordance with **IE-Rules** and have to be approved by the electrical statutory authorities. Obtaining approval from statutory authority shall be the responsibility of the contractor and any expenditure involved in getting approval from statutory authority for the drawings and documents generated by the contractor shall be borne by the contractor. Based on the detailed approved drawings, contractor shall procure and install all construction power supply equipments as required and erect as per drawing.

6.3.2 SCOPE OF 500 KVA, 11KV/433V SUB- STATIONS.

1. The scope covers preparation of Drawings, supply of required materials and Erection, commissioning and maintenance upto completion of all nine Substations. The scope of work for substation shall be as detailed below:
2. Installation of following items supplied by BHEL as free issue
 - **11KV/415V, 500KVA Transformers.**
 - **LT Kiosks**

3. Preparation of drawing for 11KV/415V substation layout in accordance with IE Rule and other statutory requirements.
4. Preparation of specifications and documents of all items covered under his scope of supply.
5. Obtaining approval of all drawings & documents from BHEL.
6. Supply and installation of PCC poles and bow/Stay rod, wire. as detailed in BOQ for double pole structures, Supply and fabrication of steel supports for installation of AB Switches, fuses etc.,
7. Supply, Laying and Termination of LT cables/ HT Cables
8. Supply and installation of cable glands, lugs, ferrules.
9. Supply and installation of 11KV Air break switch of double break- horizontal rotating type.
10. Supply and installation of 11KV Lighting arrestor set (3 Nos. each in each sets).
11. Supply and installation of 11KV HG fuse (3 Nos. each in each sets).
12. Supply and installation of Danger boards for poles & substations as per I.E. specifications
13. Supply and Stringing / Jumpering of ACSR Conductor
14. Supply and installation of 11KV disc insulator with holding clamp.
15. Supply and installation of earth pits, as per IE specification. Min 6 Nos. earth pits shall be provided for each substation.

16. Supply and Earthing of the entire substation, as specified in BOQ
17. Supply of materials and Levelling of the yard, construction of foundation for Kiosks and Transformer, structure, plinth wall, etc.,
18. Supply and installation of fencing and gates and earthing.
19. Obtaining approval for entire installation from appropriate statutory authority.
20. Commissioning and Maintenance till completion of all Substations.
21. Any Hardware items other than those covered in the BOQ that are required for the completion of works shall be arranged by the contractor at no extra cost.
22. Lump sum Rate quoted for the sub station shall cover the following works only and for other items the rate shall be on unit rate basis.
 - civil works like foundations, fencing, levelling and grading
 - Fencing and gate
 - Earth pits and earthing.
 - Supply of necessary materials for above
23. Substations works shall be carried out as per priority decided by site Engineers.

6.3.3 SCOPE OF 11 KV RING MAIN POWER DISTRIBUTION.

1. The scope covers preparation of Drawings, supply of the required materials and Erection, commissioning and maintenance of 11KV distribution systems, which shall be hooked up with Substations. The scope of work for 11KV distribution shall be as detailed below.
2. Preparation of drawing for 11KV route layout distribution.
3. Preparation of specifications and documents of all items covered under his scope of supply.
4. Obtaining approval of all drawings & documents from BHEL.
5. Supply and laying of HT cables through BHEL supplied GI/MS pipes (free issue) for cable protection.
6. Supply and installation of PSCC and RSJ joist Transmission poles,
7. Supply and installation of bow/Stay rod, wire.
8. Supply and installation of earth guards with breaking load not less than 635 kg, including accessories such as clamps, fasteners, safety boards etc.,
9. Supply and installation of 11KV top fittings (I Clamp) with back clamps.
10. Supply and installation of 11KV disc insulator with holding clamp as per ISS 3188/1965 & IEC 309/1969/Latest
11. Supply and installation of 11KV pin insulator with pins.
12. Supply and installation of 7/4.09 ACSR Raccoon conductors.
13. Supply and installation of anti climb devise- barbed wire.

14. Supply and installation of Danger boards.
15. Supply and installation of Griddle Guards of length 15 Mtrs, with 8 SWG GI Wire for Road crossing with necessary fixing arrangement etc.,
16. Supply and installation of HT Termination kits lugs.
17. Obtaining approval of entire installation from appropriate statutory authority.
18. Maintenance of 11KV distribution systems till completion of all substations.
19. **Unit rate shall be considered item basis as mentioned in BOQ.** However any accessories like clamps, fasteners, binding wire etc., which are not explicitly mentioned in the BOQ but required for completion erection works shall be supplied within the rate quoted for the respective item.

6.3.4 SCOPE OF SUB STATION YARD LEVELING AND FENCING `

1. The scope of supply and Levelling of yard cover Levelling of the yard, filling with 40 mm granite metals, construction of foundation for Kiosks and Transformer, structure, plinth wall, etc., including the supply of materials required for civil works like granite metals, cement, sand, bricks etc., Sub-station area shall be graded and sloped to prevent any stagnation of rainwater. Surface shall be covered with ballast of 15 to 20 mm size.
2. Scope of supply and installation of fencing covers supply of 3.15 mm GI chain linked wire of height 2 M including grouting of 3.0 Mtrs, height ISA 75 fabricated posts at an interval of 1.5M (2M vertical 0.5M slanting, 0.5M grouting) and three runs of barbed wire along with the fencing on the slanting angle post, fixing of mesh with post by 50x6mm MS flat with fasteners (2 Nos./ post) and earthing of fencing and gates by 8 SWG GI wire. The

substation area shall be fenced as per Indian Electricity Rules & Regulation and shall have provision of lockable door.

6.3.5 SCOPE OF SUPPLY & ERECTION OF AB SWITCHES, LIGHTNING ARRESTORS , HG FUSES ETC., ON DOUBLE POLE STRUCTURES AND STRINGING/ JUMPERING OF ACSR CONDUCTOR.

1. Contractor shall supply all materials including accessories such as clamps, fasteners etc., which are not explicitly mentioned and required for erection of AB – switches, lightning arrestors , Disc/Pin Insulators and HG fuses on double pole structures/poles.
2. Supply and installation of 11KV Air break switch of double break-horizontal rotating type as per ISS/IEC Spec No.4710/1968-265-C/1970/Latest.
3. A B Switches should be capable of breaking their magnetizing current or charging current as the case may be. Air-break switches with horns may be used for such purposes. Copper or copper clad horns should generally be used for switches. Where copper is not readily available, brass or GI rods may be used for horns with a contact pressure of ½ lb. per ampere of capacity and this may be used as a general guide in the design of switches. Current rating of switches may be based on temperature rise of not more than 30 deg C above an ambient of 40 deg. C.
4. Supply and installation of Disc/Pin Insulators and top fittings (I Clamp) with back clamps shall be as per I.E. specification.
5. Supply and installation of 11KV Lighting arrester set (3 Nos. each) as per ISS/IEC Spec No. IS307/2-1985/Latest
6. Supply and installation of 11KV HG fuse (3 Nos. each) as per ISS/IEC Spec IS9385/Latest.

7. Unit rate of PSCC poles supplied and erected for DP structure shall be on per pole basis.
8. AB switches, HG fuses, insulators and lightning arrestors shall be mounted in position as per drawing. Adequate clearance has to be maintained while erecting these equipments as per IE rules.
9. All the interconnections between LA, ABS, HG fuse insulators etc., shall be done through ACSR conductor with proper bindings and clamps etc.
10. Unit rate shall be considered item-wise as mentioned in BOQ. However any accessories like clamps, fasteners, binding wire etc., which are not explicitly mentioned in the BOQ and required for erection of above items shall be supplied within the rate quoted for the respective item.

6.3.6 SCOPE OF SUPPLY AND INSTALLATION OF POLES.

1. Pre-stressed cement concrete (PSCC) poles shall be supplied as per IS 1678 with min 280kg working load grouting with concrete of ratio 1:4:8 for size of 900x900x1500 including supply of cement, sand, metal etc to withstand wind velocity of the project
2. R.S. joist steel Poles of size - 127x114 and 29.6 Kg per Mtr and shall be supplied as per IS with min 280kg working load grouting with concrete of ratio 1:4:8 for size of 900x900x1500 including supply of cement, sand, metal etc to withstand wind velocity of the project . Stress at elastic limit shall be 27 kg per sq. m min. Modulus of section shall be Zxx: 165 sq. cm and Zyy: 48 sq. cm
3. All the poles shall be correctly aligned; suitable framework shall be made prior to concreting and back filling. All support shall be erected with excavation of earth of size 900x900x1500 and cement concrete of ratio 1:4:8 (1 cement, 4 coarse sand, 8 graded stone aggregate of 40 mm size) bed of 15 mm thick either cast in-situ or pre-cast and laid in the excavated pit irrespective of the use of base plate. The area of this concrete bed shall be 0.35 sqm. Pole shall be fixed in cement concrete 1:4:8 foundation

with not less than 30 cm thick layer of the cement concrete all around the support and foundation being continued up to 15 cms above the ground level and tapered suitably into collar.. After concreting the excavated earth shall be back filled and shall be consolidated in layers of 20 cm. Watering of concrete foundation and curing shall be done prior to loading the poles.

4. Supports for overhead line shall be of adequate strength conforming in all respects to rules 76 of Indian electricity rules. The minimum permissible span shall be limited to 40 mtrs or the distance between poles shall be as per sag calculations. Pole spacing and clearance between lowest conductor above the ground level across / along the street shall be in accordance with rule 85 of Indian electricity rule. The minimum clearance between building and line shall be in accordance with rule 79 &80 of Indian electricity rule. When two overhead lines cross, the crossing shall be made at right angle as far as possible. The vertical clearance between LV/MV and 11 KV lines shall not be less than 1.25 m. The minimum clearance between guard wire and LV/MV line shall be 10 cm and between guard wire and 11 KV line shall be 80 cm. The clearance between power and telecommunication lines shall be in accordance with the IE rules 86 & 87 and it shall not be less than 1.5 meter for 11 KV line. Poles for O/H line shall be selected for the worst combination of dead load, live load, short circuit forces, and change in temperature etc.
5. Unit rate quoted for erection of all type of poles shall include, all civil works related to foundation, including supply of foundation materials, and installation.

6.3.7 SCOPE OF SUPPLY AND INSTALLATION OF STAY/ STRUTS

1. Stay set shall consist of stay rod, anchor plate, bow tightener / turn buckle, thimbles, stay wire and stain insulators. The stay rod shall be with stay grip in case of turnbuckle is used instead of bow tightener. The entire stay set assembly shall be galvanized. The stay wire shall be either 7/4.0 mm dia or 7/3.15 mm dia GI having tensile strength of not less than 70 kgf/mm² and

conforming to IS 2141-1968/1979 grade 2. The anchor plate shall be of MS galvanised and not less than 300 mm x 300mm x 6.4 mm thick. The stay rod / buckle rods shall be of minimum 16/19 mm dia galvanised steel rod having tensile strength not less than 42 kgf/mm². Minimum length of stay rod and buckle rod shall be 1800 mm and 450 mm respectively. Guy insulator to be fixed at middle of stay wire shall be 'C' type having minimum failing load 88 KNA strut shall be of a pole of same size grouted to support the line pole wherever required. The foundation shall be same as of line poles.

2. After the location of supports / stay are pegged accurately, the excavation work shall be taken up and care should be taken while excavation that pits are not oversized. The pit should be excavated in the direction of the line. The depth and size of pit shall be such that normally 1/6th of the length of pole is buried in the ground and suitable for foundation of support. For stay the position of the pit shall normally be such stay makes as large an angle as possible with the support and it shall be in the range of 40 to 60 degree. The length of stay rod shall project 45 cm above the ground level. The pit for struts shall be located at a distance not less than 1.8 mtrs; from the pole. The depth of pit shall be such that at least 1.2 mtrs of the strut is buried in the ground
3. The stay rod with the anchor plate shall be embedded in cement concrete 1:4:8 ensure that top layer on concrete foundation is well below the ground level to prevent uprooting of the stay rod prior to load in the stay sufficient curing shall be done by watering/ moist gunny bag. The stay clamp shall be located near about the centre of gravity of the pull of the overhead line conductor. One end of stay wire shall be shall be fixed to the bow tighter or the stay grip of the stay rod and other end to the stay clamp fixed to the pole, by means of spliced joints using GI thimbles. The strain insulator shall be provided approximately at the middle of the stay wire. Turn buckle, when used, shall be installed at top of the stay wire. A stay shall be provided at all angle and terminal poles. Double stay shall be provided at all dead

ends and in such case, these shall be as far as possible, to be set parallel to each other. If the stay rod cannot be erected in accordance with the above due to roadways or obstructions of building etc; bow stay or strut which ever is suitable to the location shall be used.

4. Unit rate quoted for erection of all type of poles shall include, all civil works related to foundation, including supply of foundation materials, and installation.

6.3.8 SCOPE OF SUPPLY AND INSTALLATION OF CROSS ARM:

1. Cross arm shall be made of MS structural steel as per IS standard. The length of cross arm shall be suitable for accommodating the number of insulators with spacing of conductor. Size of V cross arm shall be 920 mm long with 75 x 10 mm channel.
2. A minimum distance of 1120 mm for the line shall be left from the centre of pin hole of insulator on either end of the cross arm. A gap of 50 mm shall be left from the centre of pin hole to end of cross arm in either side. The cross arm shall be complete with pole clamp made of MS flat of size not less than 50x6 mm with necessary nuts bolts washers. The cross arm shall pin holes as required. The length of cross arm for carrying guard wires shall always run not less than 30 cms beyond outer most bare conductor of configuration. The cross arm and pole clamps shall be treated with one coat of red oxide metal primer before erection and finished with two coats of approved aluminum paint. Cross arms shall be properly clamped to the support taking into consideration the orientation of the lines
3. Unit rate quoted for erection of cross arms shall include supply and fixing of clamps, fasteners etc.

6.3.9 SCOPE OF SUPPLY AND OF STRINGING/ JUMPERING OF ACSR CONDUCTOR:

1. Supply of 7/4.09 ACSR Raccoon conductors shall as per IS 398/1961
2. The general precautions during storage and handling shall be in accordance with relevant IS code.
3. While paying off, the conductor shall be taken from top of the drum and the drum repeated in the direction of arrow on it. Care shall be taken during paying off to avoid contact with steel works, fence etc by giving soft wood protection, using wooden rollers. Proper tools shall be used during stringing work.
4. During stringing operation standard sag table or chart shall be followed and care shall be taken to ensure that there are no kinks in the conductor. Joints in conductors shall be staggered. Mid span joints in conductor shall be avoided. After stringing the conductor, it shall be clamped permanently with shackle or strain clamps. An angle or section points shall be selected while pulling up conductors. All strands of the conductors must be gripped securely when pulling the conductors. When the work is being carried out adjacent to and for connecting to an existing system in operation or along parallel to an existing line is involved, adequate safety precautions for isolation, discharging, earthing etc. shall be taken to ensure that line do not inadvertently get charged from live supply. Where permit to work system is in vogue, regular safety procedure prescribed should be complied with.
5. While stringing, sufficient length of conductors shall be kept at shackle termination for making jumpers. Jumper shall be neat and as far as possible symmetrical to the run of conductors. These shall be so made to prevent occurrence of fault due to wind or birds. Where necessary jumpers shall be with insulated conductor or insulated as per instruction of Engineer-In-Charge.

Parallel greave (PG) clamps may be preferred to binding of conductors at jumper location or service taps.

6. Jumper used shall normally be of the same material as the line conductor and be of adequate current carrying capacity. If the material of the jumper wire is different from that of the line conductor, suitable bimetallic clamps should be used. If copper to aluminium bimetallic clamps are to be used, it should be ensured that the aluminium conductors is suited above the copper conductor so that no copper contaminated water comes in contact with aluminium. Supply of Jumper is part of stringing.
7. For High voltage lines, the jumpers should be so arranged that there is a minimum clearance of 30 cm; under maximum deflection condition due to wind, between the live jumpers and other metallic parts. This may involve erection of pin insulators specially for fixing the jumpers.
8. Necessary earth guards shall be provided across the road, wherever required, including LT supply line crossings. Fabrication and erection of earth guards is the responsibility of the contractor. The guard wires shall have breaking load not less than 635 Kg, and shall be galvanized if made of iron or steel.
9. Every guard wires or cross connected systems of guard wires shall have sufficient current carrying capacity to avoid risk of their fusing on coming to contact with any live wire. Wire Guards shall be properly earthed at terminal supports. The contractor at his cost shall arrange all hardware required for the entire job.
10. Unit rate quoted for Stringing/ Jumpering Of ACSR Conductor shall include supply of accessories like clamps, fasteners, binding wire etc. which are not explicitly mentioned in the BOQ and required for Stringing/ Jumpering of ACSR Conductor.

6.3.10 SCOPE OF SUPPLY AND INSTALLATION OF PORCELAIN INSULATORS & FITTING

1. Supply of 11KV pin insulator with pins shall be as per ISS 2544/1963 AMD 125&IEC 168/1969 Latest
2. Supply of disc insulator with fixing & conductor and holding clamp shall be as per ISS 3188/1965 &IEC 309/1969/Latest
3. This shall be glazed, crack/ burr free. Insulator shall have adequate mechanical strength, high degree of resistance to electrical puncture and resistance to climatic and atmospheric attack. Insulators shall be pin type for straight run and up to maximum of 10 deg. angle deviations and disc type for pole position having more than 10 deg. angles or for dead end lines.
4. All iron parts shall be hot dip galvanized & all joints shall be airtight.
5. Pin insulators / shackle insulators / disc insulator shall be erected on cross arm and "D" iron clamp shall be used or as specified by the Engineer-In-Charge. Shackle insulators shall be used in conjunction with "D" iron clamp when configuration of conductor is vertical. These shall also be erected on cross arm at intermediate support in case of long lines, deviation from straight line. Care shall be taken that insulators are not damaged during erection.
6. Binding of conductor with the insulator shall be done with 12 SWG soft aluminium wire /conductor. The binding of conductor to insulators shall be sufficiently firm and tight to ensure that no intermittent contact develops. The end of binding wire shall be tightly twisted in a close spaced spiral around the conductor to ensure good electrical contact and strengthen the conductor.
7. Unit rate quoted for erection of Pin/shackle/disc insulator shall include supply of accessories like clamps, fasteners, binding conductors wire etc. which are not explicitly mentioned in the BOQ and required for Erection of Insulators.

6.3.11 SCOPE OF SUPPLY AND INSTALLATION OF SAFETY & PROTECTIVE DEVICES

1. All required signboards, caution boards and safety boards shall be arranged and installed by the contractor in all poles and sub-stations wherever required as part of respective works. Feeder description and line description shall be displayed at vital locations. Foremost importance shall be given to Safety, and the contractor shall adhere to safety instructions and ensure use of safety appliances, as required. The contractor shall provide all safety equipments to his workmen to avoid accidents.
2. All supports carrying HV lines shall be fitted with danger plates confirming to IS 2551 -1963 at height of 3 meter from ground indicating the voltage of line. The script shall be both in "English / Hindi".
3. Unless other wise specified barbed wire confirming to IS 278-1969, having 4 points barbs spaced 75 +/- 12 mm apart shall be wrapped helically with a pitch of 75 mm around the limb of support and firmly commencing from the height of 3.5 mtrs and up to height of 5 or 6 m as directed by Engineer -In - charge
4. Unit rate quoted for erection of safety/protective Devices include supply of accessories like clamps, fasteners, etc. which are not explicitly mentioned in the BOQ and required for Erection of Insulators.

6.3.12 SCOPE OF SUPPLY AND INSTALLATION OF LIGHTNING ARRESTOR

1. Supply of 11KV Lighting arrestor set (3 Nos. each) shall be as per ISS/IEC Spec No. IS307/2-1985/Latest
2. The lighting arrestor shall be non-linear type, distribution class, out door type suitable for effectively earthed system. The lightning arrestor shall consist of line terminal stud, earth terminal stud, number of spark gaps in series with non-linear resistor, the whole assembly housed inside a hermetically sealed porcelain bushing.

Neoprene rubber gasket shall be provided between metal caps and porcelain bushing. Non-linear resistor shall be of silicon carbide blocks metalised at both ends to ensure good electrical contact. Compression spring shall be provided to keep good electrical contact between terminals, non-linear resistor & spark gaps. Mounting bracket shall be hot dipped galvanized suitable for mounting lightning arrester on structure.

3. The lightning arrester shall be installed one unit per phase at terminations, transformer station etc. as directed by Engineer-In – Charge. These devices shall be connected ahead of fuse provided if any. Independent earth electrode shall be provided for lightning arrester. The earth lead from earth electrode to lightning arrester shall be continuous and if desired through out earth surface by alkanthine pipe.
4. Unit rate quoted for erection of LA shall include supply of accessories like clamps, fasteners, etc. which are not explicitly mentioned in the BOQ and required for Erection of Insulators.

6.3.13 SCOPE OF ERECTION, TESTING AND COMMISSIONING OF 500 KVA – ONAN TRANSFORMER.

1. 500 KVA, 11/0.413 KV ONAN transformers will be supplied by BHEL(that may be new or diverted from other sites) and the same shall be drawn from BHEL-stores or yard and transported to the required location. The contractor has to make his own arrangements for loading the transformers from BHEL – Stores and unloading the same at the specified location. Necessary T & P and other materials required for loading and unloading the transformers have to be arranged by the contractor. All grouting material shall be arranged by contractors.
2. Old Transformer (diverted Transformer) shall be checked up thoroughly and if any items are found to be damaged and requires replacement, the same shall be carried out by the contractor at within the quoted rate. However replacement materials shall be arranged by BHEL including Transformer oil.

3. All BHEL transformers will be supplied in oil filled and assembled conditions. Oil filtration shall be carried out for all the transformers supplied by BHEL.
4. Contractor shall make his own arrangement for unloading, storing of Transformers
5. All testing Instrument such as megger, multimeter, oil test kit, oil-filtering machine, H.V. test kit shall be arranged by the contractor to carry out the checking of the transformer. Oil filtration shall be carried out by the contractor till achieving the dielectric strength as stipulated, other tests like Insulation resistance and earth resistance checks, Dielectric strength test of oil before filling, Bucholtz relay test and Phase sequence test shall be carried out by the contractor. After completing all the works, full painting shall be carried out for all the transformers.
6. Lumpsum rate shall be quoted for Erection and testing & commissioning of transformers.

6.3.14 SCOPE OF ERECTION AND COMMISSIONING OF L.T. KIOSK.

1. L.T. Kiosk will be supplied by BHEL, (which may be diverted from other sites) and the same shall be drawn from BHEL-stores and transported to the required location. The contractor shall make his own arrangements for loading the L.T. Kiosk from BHEL – Stores and unloading the same at the specified location. The contractor shall arrange necessary T&P and other materials required for loading and unloading. Necessary civil foundation including supply of materials shall be arranged by the contractor before erecting the L.T. Kiosk within the quoted rate.
2. If any loose items supplied along with L.T. Kiosks are required to be mounted, the same shall be carried out by the contractor at no extra cost.
3. Kiosk shall be checked up thoroughly and if any items are found to be damaged and requires replacement or any internal wiring to be modified, the same shall be carried out by the contractor within

the quoted rate. However replacement materials shall be arranged by BHEL.

4. The base frames shall normally be supplied along with the Kiosks. These shall be aligned, levelled and grouted in position, as per approved drawings. Wherever the base channels are not available, the same shall be supplied, fabricated and painted at site. Base channels shall be grouted on the foundation. Payment for supply, fabrication shall be on tonnage basis.
5. Lump sum rate shall be quoted for Erection and testing & commissioning of LT Kiosk.

6.3.15 SCOPE OF SUPPLY / LAYING AND TERMINATION OF H.T. AND L.T. CABLE

1. GI/MS pipes wherever required for cable protection shall be supplied by BHEL (free issue) for Laying and termination HT cables. Supply of HT and LT cables is covered in contractor's scope.
2. Pipes shall be of assorted sizes diverted from various closing sites. Wherever required, the over-head lines shall be interconnected through underground cable. 3 Core 11 KV – XLPE, aluminium - armoured cable shall be laid above ground/ below ground through GI/MS pipes and terminated with out/indoor termination kits. Outdoor cable termination kits shall be used at the overhead line like feeding point and road crossings if required. The cables thus shall be cut to size as per route length and laid. H.T. Cable termination shall be carried out only by the HT cable jointer with utmost care. Cable laying and termination shall be in accordance with IS-specification as listed as a part of this document. The cables shall be suitably supported so that the cable load should not cause strain to the equipment connected.
3. If suitable cable box is not supplied along with the equipment i.e. the transformer, suitable cable adaptor boxes shall be arranged by the contractor and cable termination shall be carried out by using suitable cable glands etc., as required.

4. The cables drawn from the BHEL stores shall be meggered before laying and any defect observed after laying also, the contractor shall replace / rectify the same. As far as possible cable crossing shall make use of existing culverts, trenches etc. Wherever required GI/MS pipes or Hume pipes shall be used or the cable may be buried as directed by site Engineer.
5. Unit rates of laying of cables directly buried in ground or laid in pipes or Hume pipes shall be applicable for lengths of cables laid and shall be measured between the two points of cables entering into the ground/pipes and shall be same as that for the cables of same size laid in cable tray.
6. Buried cables shall be identified by cable markers.
7. Cable route shall be decided before cable laying work is under taken. While shortest possible route should be referred, cable runs shall generally follow fixed development such as road, foot paths etc., with proper offset so that future maintenance, identification etc., are rendered easy. While selecting cable route, corrosive soils, surrounding sewage effluent etc. shall be avoided, where this not feasible, special precaution as decided by Engineer-In-Charge, particularly for HV cable, shall be taken. Power and communication cable shall cross at right angles, as far as possible. Where power cables are laid in proximity to communication cables, the horizontal and vertical clearance shall not be less than 60cm. During the preliminary stages of cable laying, consideration should be given to proper location of the joint position so that when cable is laid the joints are made in most suitable places. As far as possible water logged location, carriageways, pavements, proximity to telephone cables, gas to water mains, inaccessible places, ducts, pipe racks etc., shall be avoided for joint position.
8. The cable installation including necessary joints shall be carried out in accordance with the specification IS 1255-1967
9. The minimum width of trench for laying single cable shall be 35 cm. Where more than one cable is to be laid in the same trench in

horizontal formation, width of trench shall be increased such that inter axial spacing between the cables, (20 cm for 415volts, and 35 cm for 11 KV) can be maintained.

10. The trenches shall be excavated in reasonably straight lines. Wherever there is change in direction, the minimum safe bending radius for all type of PVC cables shall be 12 times the overall diameter of the cable. A larger radius shall be adopted at joints and termination; it shall not be less than 15 times of its overall diameter. Adequate precaution shall be taken while excavation of trenches to avoid damages to existing cables, pipes or such installation in the proposed route during excavation. Wherever bricks, tiles or protective covers or bare cables are encountered, further excavation shall not be carried out without the approval of Engineer -In-Charge. Where there is any danger of trench collapsing /endangering adjacent structures, the side should be well shored up with timbering and or sheeting as excavation process. This should be followed by back filling wherever necessary. The bottom of the trench shall be level and free from stone, brickbats etc. The trench shall be provided with a layer of clean and dry sand cushion of not less than 8 cm in depth.
11. Continuity and insulation measurement test shall be performed for cable core before and after laying in the trenches, if any abnormality is observed, the same shall be brought to the notice of Engineer- in -Charge. End of the cables shall be sealed with suitable moisture seal tape in case of PVC cables and XLPE cables shall be sealed with end seal caps. Cable laid in trenches in single tier formation shall have covering of clean dry sand of not less than 17 cm above the base cushion of sand before the protective cover is laid. In case of vertical multi tier formation after the first cable has been laid, a sand cushion of 30 cm shall be provided over the initial bed before the second tier is laid. If additional tiers are formed, each of the subsequent tiers also shall have sand cushion of 30 cm as stated above. The top most cable shall have final sand covering not less than 17 cm before protective cover is laid.

12. Unless otherwise specified, the cable shall be protected by bricks of not less than 20cms x 10 cms x 10cms (nominal size) as per CPWD building specification or protective cover placed on the top of the sand and both sides of cable (bricks shall be laid breadth wise for cable top protection / height wise for cable side protection) for full length of cables to the satisfaction of EIC. Where more than one cable is laid in the same trench. This protective covering shall cover all the cables and projects at least 5 cms. over the sides of the end cables. A layer of bricks shall be laid in between two cables when more than one cable is laid in same trench.
13. The trenches shall be then back filled with excavated earth free from stones or other sharp edged debris and shall be rammed and watered, if necessary, in successive layer not exceeding 30 cms, unless otherwise specified. A crown of earth not less than 50 cms in the centre and tapering towards the sides of the trench shall be left to allow for subsidence. The crown of earth however should not exceed 10 cm so as not to be hazardous to vehicular traffic. The temporary reinstatements of road ways should be inspected at regular intervals, particularly during wet weather and any settlement should be made good by further filling as may be required.
14. Route marker shall be provided along straight runs of cables and at change in direction locations as approved by EIC and in general at intervals not exceeding 100 meter in straight run. Route marker shall be made out of 100 mm x 100 mm x 5 mm GI/Aluminium plate bolted or welded on 35 x35 x6 mm MS angle iron of 600 mm long. Such route marker shall be mounted and grouted parallel to and 0.5 meter away from the side of trench. The word "Cable" and voltage grading, size of cable shall be inscribed on the marker.
15. In location such as road crossing, entry to building, on poles, in paved area etc., cable shall be laid in pipe. GI /MS or spun reinforcement pipe shall be used for such purpose. The size of the

pipe shall be not less than 10 cms dia for single core cable and not less than 15 cms for more than one cable in a pipe. These pipes shall be laid directly in the ground without any special bed except for SW pipes which shall be laid over 10 cms thick cement concrete 1:5:10 bed. No sand cushion or tiles shall be used in such situation, unless otherwise specified. The top surface of pipe shall be at minimum depth of 1 meter from ground level when laid under road, pavements etc.,

16. Cables shall be suitable for laying in metal trays, conduits or for direct burial in ground both in wet and dry conditions.

6.3.16 SCOPE OF WORK FOR SUPPLY, FABRICATION AND INSTALATION OF SUPPORT STRUCTURES FOR 11/. 433 KV SUB STATION.

1. The scope of supply and fabrication generally includes fabrication and erection of steel structure supports for double pole arrangement with all structural member (ISMC 100 for line stringing, ISMC 75 for fixing of AB switch, LA and HG fuse and ISA 50 for cross brazing wherever required) and fabrication /fixing of Gates/fencing supports for substation.
2. Steel fabrication & installation required for substations shall be carried on tonnage basis.
3. All the T&P including consumables such as welding electrodes, gas etc., shall be arranged by the contractor within the quoted rate.
4. All the fabricated steel materials shall be painted as per the details given in the scope of painting.
5. Unit rate quoted for supply and fabrication & installation of steel shall covers Painting, including supply of paints.

6.3.17 SCOPE OF EARTH PITS AND EARTHING SYSTEM

1. The scope of earthing covers earthing of all substation equipments, poles, structures and providing earth pits as detailed in the BOQ.
2. Supply and installation of earth pits, with electrode of 3 Mtr long. Each pit shall be filled with alternate layer of charcoal & salt as per IE specification and making of brick chamber, with both side plastering, supply and fixing of manhole cover plate with RCC slab etc., complete as per IS 3043. Min 6 Nos. earth pits shall be provided for each substation.
3. Number of earth pits for substation shall be decided considering soil resistivity. However, each substation shall have minimum of two earth electrodes for neutral earthing, two earth electrodes for body earthing and two earth electrodes for lightning arrestor earthing.
4. Separate unit rate on number basis shall be applicable for Earth pits provided out side sub stations like at the poles of Road crossing and Double/Six pole structures etc., Similarly unit rate on meter basis shall be applicable for Earthing provided out side sub stations like at the poles of Road crossing and Double / Six pole structures etc.,
5. **Supply of earth pits and earthing materials including supply of earthing materials for 11KV/433 V sub station shall be part of substation scope. No separate amount shall be payable for the Earth pits earthing provided for the sub stations.**
6. Earthing installation shall confirm various clause of IS 2052. All system neutrals, grounding terminals of surge arrestors and Transformer shall be connected to earth pits. Earth electrodes shall be of 40 mm dia galvanized steel pipe.
7. Entire system shall be earthed in accordance with the provisions of the relevant IEC recommendations/IS code of practice IS 3043-

1947 and Indian Electricity Rules, so that the values of the step and contact potentials in case of faults are kept within safe permissible limits.

8. Earthing conductor shall be of galvanized steel strip/wires.
9. Overhead lines shall be earthed by continuous galvanized steel overhead earth wire fastened to each pole and connected with earth at minimum three points in every km length. Cross section of earth wire shall not be less than 25 sq. mm.
10. All metal supports of overhead lines and metallic fitting attached shall be permanently and effectively earthed. Cage guard/ cradle guard shall be made of 8 SWG GI wire conforming to IS 2633 including netting, stretching and jointing of cage and lacing by SWG 10/12 SWG GI wire, binding by 14/16 SWG GI wire. Junction and terminal locations all special structures may be selected for connecting to earth. All the panels / junction boxes shall be earthed at two points.
11. All double pole structure, supports, guarding and guy wires etc., shall be earthed.

6.3.18 SCOPE OF FINAL PAINTING

1. Painting shall be carried out for all the steel fabricated items.
2. After the completion of installation, all the items are to be painted with two coats of Aluminium paint over the two coats primer paint and the required paints along with the required materials for painting have to be arranged by the contractor at his cost. No materials will be supplied by BHEL for carrying out the painting works. The paint used should be of reputed make confirming to I.S. specification.
3. Scope of painting shall also include Painting of BHEL supplied equipments/Items that are to be erected by the contractor.
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.

6.4.0 DETAILED SCOPE OF WORKS – YARD LIGHTING:

6.4.1 SWAGED LIGHTING POLES:

1. Lighting poles for flood lights shall be of stepped tubular/ swaged type 11 M long steel poles as per applicable standard. The steel poles shall be coated with bituminous preservative paint on the inside as well as outside surface. Exposed outside surface of steel poles shall be painted with one coat of red lead oxide primer. After of installation, two coats of Aluminum paint shall be applied
2. The poles shall be supplied with associated pole mounted Junction Boxes, suitable MS base with shop drilled holes or by suitable clamps for fixing of light fixtures. No cutting or drilling of galvanized structure is permitted.
3. The lighting poles shall be erected at the locations shown in the layout drawing. The scope of erection work shall include excavation of earth, as per drawing, grouting with concrete of ratio 1:4:8, supply of cement, sand, metal etc to withstand wind velocity, mounting of assembled fittings, wiring/ cabling from junction box at the bottom of pole up to the lighting fixture, installation of 50mm GI pipe for cable protection from trench to junction box for loop-in-loop-out cable.
4. Unit rate quoted for Erection of lighting pole includes Earthing of lighting pole Junction boxes and lighting fixtures, in compliance with IE rules and applicable Indian Standard. Each lighting pole JB shall be earthed by 25X3mm GI Flat bonded to 25 mm dia GI earth electrode of 3 meter length driven vertically in the ground. 14SWG GI wire shall be taken from fixture to JB including fixing of clamps.

6.4.2 LIGHTING FIXTURES:

1. Flood light luminaries shall be of weather proof, Aluminium cast housing, anodized aluminium mirror polished reflector, heat resistant, toughened glass cover with necessary neoprene gaskets to prevent ingress of dust, moisture and insect, porcelain lamp

holder, cable gland, earthing terminals etc. The housing shall be supported on a cast iron/ aluminium base and capable of being swivelled in both horizontal and vertical directions and locked in any desired position

2. The luminaries shall be supplied with Non- integral weather proof control gear box, suitable for use with High pressure metal halide lamps up to 400W
3. Luminaries shall be of continuous trouble free operation under atmospheric conditions, without reduction in lamp life or without deterioration of materials and internal wiring. Fixtures shall be provided with outdoor type weather proof box with IP-54 or better. Applicable standards are **IS: 1913, IS: 1777, IS: 4012, IS: 4013.**
4. Lighting fixtures includes supply of single ended or double ended High pressure metal halide lamp, as required. The lamp shall be with quartz discharge tube and transparent/ internal coated shell, quick restrict time (of within 5 minutes) and with burning life (about 5,000 hours) in standard rating. Applicable standards are **IS: 10322, IS: 9974.**

6.4.3 CABLES & WIRES:

1. The cable shall be 1100V grade, multi core, stranded Aluminium conductor, PVC insulated, armoured cables of sizes 3.5C x 70 sqmm, conforming to **IS: 1554** used for incomer and Light mast feeders and 3.5C x 16 sqmm used for outgoing feeders. The wires for wiring in lighting system shall be 1100V grade, 1 core, 2.5 sqmm, PVC insulated, unarmored with stranded Cu conductors conforming to **IS: 1554.**
2. Scope of 3.5X70 sqmm and 3.5C x 16 sqmm cable work includes excavation of earth upto 600mm, refilling, laying of cables, termination, supply of cable lugs, glands and cable markers .The cable marker shall be provided at interval of 25 meter i.e. in between poles. Laying and termination of 1X2.5 sqmm PVC wire shall be part of pole erection.

6.4.4 LIGHTING DISTRIBUTING BOARD (LDB):

1. LDB shall be totally enclosed dust and vermin proof cubicles without louvers and suitable for outdoor application and wall/ column/ structure mounting type with sloping canopy confirming to IP 55 class
2. LDB shall be constructed from CRCA sheet. The sheet steel used shall be cold rolled and 2mm thick. The construction of LDB shall ensure adequate rigidity. All components of the LDB shall be fully mounted inside the panel. LDB shall have only one operational front. Door shall be provided to give full access to all the components. Door shall have padlocking arrangement.
3. Good quality synthetic rubber/ neoprene gaskets shall be fixed around the door. The door when closed, shall compress the gasket uniformly.
4. LDB shall be designed to prevent contact with live parts when the front door is open.
5. LDB shall be fitted with MS mounting brackets and adequate size of removable undrilled gland plate of 3mm thickness.
6. LDB shall be fitted with two GI earth studs located in accessible position on the outside of the panel on opposite sides.
7. All metal parts of the panel except current carrying parts shall be bonded together electrically to the earthing stud. Phase barriers of fireproof insulating material shall be fitted in such a manner that it is not readily possible for personnel to touch the phase bus bars.
8. LDB shall be with one incomer with 200A MCCB, six Nos outgoing feeders with 32A MCBs and three indicating lamps with fuses for indicating bus supply ON and Power terminals. LDB shall be provided with earth stud, earth bus bar etc designated with labels. Applicable standard are IS: 2675, IS: 4237, IS: 13947
9. The location for erection shall be decided at site, in consultation with BHEL Engineer. Any mounting arrangement like construction

of foundation, fabrication and fixing of mounting supports including supply of materials like cement, sand, steel, metal etc shall be arranged by the vendor at his cost. Fabrication materials like angle and channels will be supplied by BHEL. The scope of erection of LDB includes providing 2 nos of Earth pits with 3 meter depth Earth electrode and connection using 25 X 3 GI flat

6.4.5 ERECTION AND COMMISSIONING OF LIGHT MAST

1. The Light mast shall be supplied by BHEL. The scope of erection and commissioning shall be inline with LT KIOSK.
2. However the casting of foundation is in the scope of contractor including supply of all materials as required in the drawing.

6.5.0 SCOPE OF TESTING AND COMMISSIONING

1. The contractor shall take the full responsibility of testing and commissioning of the equipment being installed by him under the overall supervision of BHEL. 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 these will be witnessed by BHEL Engineers and reports signed jointly. The contractor shall submit a checklist to BHEL prior to taking up testing and commissioning activities and the activities shall be carried out in accordance with the checklist approved by BHEL.
2. The contractor shall arrange for sufficient manpower including Engineer and supervisors for carrying out the activities under his own responsibility in coordination with various other agencies.
3. In case, any rework is required because of contractor's faulty erection which is noticed during commissioning, the same shall be rectified by the contractor at his cost.

4. All testing instruments that are required for the successful commissioning shall be arranged by the Contractor, within the quoted rate.

6.6.0 SCOPE OF STORAGE / TRANSPORT OF CONTRACTOR SUPPLIED ITEMS.

1. Contractor shall make his own arrangement for storing the materials and the materials shall be stacked in the area allotted for contractor. Contractor shall also make his own arrangement for transporting these materials to site. Necessary material handling equipment for transporting to site/ stores and also for taking delivery from stores to work place shall be arranged at his cost.
2. Any excess materials supplied for which payment has not been made can be taken back by the contractor as per customer procedure.

6.7.0 SCOPE OF SECURITY FOR CONTRACTOR'S T&P AND MATERIALS

1. The contractor shall arrange at his own cost and expense 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 T&P and supply materials. The contractor may consult the Engineer-in-Charge on the arrangements made for general site security and take such supplementary action, as the contractor deems necessary for protection of his machinery, equipment, tools etc.,
2. Contractor shall arrange and provide watch and ward round the clock for the materials in his custody as well as item and equipment erected by him. Contractor shall implement local labour laws, maintain necessary records and co-ordinate with the local labour authorities on all matters of labour and industrial relations.

6.8.0 SCOPE OF MANPOWER SUPPLY AND OPERATION & MAINTENANCE

1. The manpower supplied shall be experienced in the field work. Engineer/The supervisor shall have minimum qualification of Diploma and Electrician shall be ITI Certificate holder with necessary license.
2. Engineers /Supervisor and electrician shall be reported to site in charge/Engineer of electrical in-charge every day and carry out of the job as directed by them.
3. A lump sum rate shall be quoted for manpower per month basis which includes transportation cost etc
4. After energizing the sub-stations, contractor shall maintain all the electrical installation for 24 Months as per monthly rate quoted for O&M . The time for maintenance **shall commence after energisation of 4 substations**. The contractor shall identify separate manpower for maintenance. The manpower identified for such maintenance works shall not be utilized for the regular erection works of the contract.
5. The contractor shall operate and maintain the system by deploying electrician, helpers, supervisor etc., per shift for three shifts a day as per the instruction of Engineer in charge. Depending upon construction activities and power requirement contractor will be permitted to withdraw their maintenance personnel with approval of BHEL site in charge.
6. Contractor shall attend the break down and replace the defective components promptly. Failing which BHEL will get the same done at the risk and cost of the contractor.
7. During the maintenance period, if the contractor fails to deploy adequate manpower, BHEL shall engage a maintenance agency at the risk and cost of contractor. All the tools and plants required for preventive maintenance and breakdown maintenance shall be arranged by the contractor. Contractor shall also arrange for all

spares required for maintenance work of for 11/.415 KV substation and 11 KV distribution on chargeable basis as per unit rate quoted.

6.9.0 MATERIALS SUPPLY AND WORKMANSHIP

1. Scope of supply of materials shall be as detailed in the BOQ. All materials shall be procured from reputed manufacturers as per IS specification. Contractor shall ensure technical compliance for supply and erection to ensure trouble-free operation. Necessary test certificates, guarantee certificate etc. shall be submitted to BHEL before proceeding with installation.
2. The quantities furnished in the BOQ for Supply Items are approximate only. Contractor shall assess the quantity of supply items after conducting route survey, which is part of this contract and also taking into consideration the materials available with BHEL.
3. **50 % of the materials covered in the BOQ shall be supplied immediately after award of the contract. Balance materials shall be supplied as per requirement after Route survey and detailed Engineering.**
4. Before starting erection, the contractor shall get all the supply items in his scope verified by BHEL and also get necessary endorsement from BHEL Stores. BHEL's endorsement or Stores Receipt Voucher shall be submitted along with bills for payment for Supply Items. After BHEL verification, material shall be kept under contractor's custody.
5. The contractor shall supply all equipment as per the technical details furnished in the specification. In case of any slight variations from values indicated at the contract stage due to reasons like the standard manufacturing practice of various equipment vendors, the contractor shall get prior approval from BHEL. Such variations shall not affect the quality and performance of the equipment

6. Equipment supplied shall be complete in every respect with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the technical specification unless included in the list of exclusions. Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost. All similar standard components/parts of similar standard equipment provided, shall be inter-changeable with one another.
7. The Contractor shall supply type tested (including special test if any as per technical specification) equipments and materials especially for LA, Insulators, AB switch, HT cables. The type test shall be from CPRI or any equivalent/approved institutions . The test reports shall be furnished by the Contractor along with equipment/material drawings. In the event of any discrepancy in the test reports, i.e. any test report not acceptable due to any design/ manufacturing changes or due to non-compliance with the requirement stipulated in the Technical Specification and/or IEC/IS, such materials will not be accepted. The decision of BHEL Engineer will be final in this regard.
8. For HT/LT cables contractor shall submit routine test certificate.
9. Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall be interchangeable with, and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

10. Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favourable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

6.10.0 CONTRACT EXTENSION

If the project completion gets delayed beyond contract period for the reason not attributable to the contractor, then depending on the balance left out work of the project, BHEL at its discretion may extend the contract.

6.11.0 SCOPE OF SUPPLY OF TOOLS & TACKLES AND CONSUMABLES.

1. Tools and Plants: Contractor shall provide all tools and plant, handling equipment, as required for goods, services, handling at site, installation, testing, commissioning, operation and maintenance of the complete scope of Supplies and Work covered in this Tender Specification. It may be noted that BHEL will not provide any Tools and Plants. The contractor shall provide all the necessary temporary structures etc. required for this work. In the event of contractor failing to arrange the required tools and plants and testing equipments and non-availability of the same owing to breakdown, or otherwise, BHEL will take appropriate action at contractor's risk and cost. The T&P and testing equipments arranged by the contractor shall be in proper working condition, which shall not lead to unsafe conditions.
2. Consumables: The contractor shall provide all consumables required for carrying out the work covered under this scope of work and 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.

3. If at any time during the execution of work, it is noticed that the work is suffering on account of non-availability of consumables from the contractor's side BHEL will take appropriate action at his cost and risk. BHEL will not provide any Consumables for the scope of Services and Supplies under the scope of this Tender Specification.

6.12.0 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 BHEL.
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 prevailing 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.

6.13.0 PERMITS, LICENSES ETC.,

The contractor shall obtain all permits, licenses or other authorizations as are required for this work in terms of the order, from local state or Central Authorities. He shall comply with all rules, regulations and other statutory obligations under the State of Union Legislative enactments.

6.14.0 ALLOCATION OF LAND AND OTHER FACILITIES.

1. BHEL will make available to the contractor open levelled land at site for the construction of the contractor's facilities viz, office, stores, tool room, fabrication yard, sanitary facilities, etc.,
2. The allocation of land by the Engineer-in-Charge to the contractor for his facilities shall necessarily be governed by the overall project interest and the contractor shall accept without protest such areas of land allotted to him for his facilities.
3. The contractor shall be responsible for the construction of office, stores, fabrication shop, tool-room, sanitary facilities etc. and all costs and expenses in connection therewith shall be solely to the account of the contractor. The type and location of the sanitary facilities shall be subject to the approval of the Engineer-in-Charge.
4. Accommodation outside the project site as required for contractor's personnel will be arranged by the contractor at his cost and expense.
5. All transportation for contractor's personnel shall be the responsibility of the contractor and shall be to his account.
6. BHEL will provide a single source of 415 V ,3 phase power supply for construction purposes at free of cost. The contractor shall make his own arrangement to extend this to the working area to meet his construction requirements. In case the Power Supply source location is not suitable due to longer distance etc., the contractor shall make his own arrangement like providing DG sets to meet the requirement.

6.15.0 GUARANTEE PERIOD - FOR SUPPLIES & ERECTION.

1. The guarantee period will be 12 months for Supply, Erection and Commissioning work from the start of guarantee period. . The **guarantee period will commence from the date of commissioning of the last substation.**

2. The materials supplied shall be of reputed make as per IS standards.
3. The contractor shall be responsible for the quality of workmanship, shall guarantee the work done, shall rectify/replace within the quoted rate all defects due to faulty supply/erection/commissioning during the guarantee period.
4. 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.
5. The design and workmanship shall be in accordance with the best engineering practices to ensure satisfactory performance throughout the service life. If at any stage during the execution of the Contract, it is observed that the erected equipment(s) do not meet the above minimum clearances, the Contractor shall immediately proceed to correct the discrepancy at his risks and cost.
6. However the Guarantee period amount 5% shall be released on submission of Bank Guarantee for an equivalent amount from a Nationalized/ Scheduled Bank in the prescribed proforma of BHEL.

6.16.0 TIME SCHEDULE

1. The contractor has to commence the work within 7 days from the date of issue of Fax/ E-mail LOI.
2. The entire scope of work - erection, testing and commissioning should be completed **within 8 months** from the date of issue of Fax/ E-mail LOI. Works shall be taken up simultaneously both on 11/.415 KV sub station and 11KV distribution to meet the schedule. The O&M will be for a period of 24 months after commissioning of minimum 4 substations.

3. Contractor shall draw the monthly erection programme along with BHEL engineer indicating the work to be achieved and event to be completed, based on bar chart submitted by contractor. 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 programmes.
4. BHEL, owing to its commitment to their customer, may ask contractor to compress the total completion schedule. Contractor shall plan his activities and mobilise additional resources accordingly to the satisfaction of BHEL engineer within the quoted rates.
5. The work under the scope this of contract shall be deemed complete in all respects only when all the components/equipment are erected and testing and commissioning of the equipment are completed. The decision of BHEL in this respect shall be final and binding on the contractor
6. During the tenure of contract, if BHEL is not satisfied with the progress of work, BHEL will have the right to withdraw any portion of work / balance work and get the same done either directly employing their own men or through other agency at Contractor's risk and cost. Contractor shall not be entitled for any compensation whatsoever in this refund.

6.17.0 ERECTION AND PROGRESS AND MONITORING OF WORK

1. It shall be the responsibility of the contractor to provide all the relevant information on a regular basis regarding erection progress, labour availability, equipment deployment, etc.
2. The contractor shall submit daily, weekly and monthly progress reports, manpower reports, material reports, equipment reports etc. The progress reports shall indicate the progress achieved against planned with reasons indicating the delays, if any. The

report shall also give the remedial actions, 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.

6.18.0 MEASUREMENT, 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, ACSR conductor, 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. 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. 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.
5. For all site-fabricated steel items 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.
6. The wastage allowances as permissible for various items are as indicated below. Cutting and wastage allowance shall be computed

on the lengths and weight of materials actually used, measured and accepted.

7. The erection contractor shall make every effort to minimize wastage during erection work. In any case, the wastage shall not exceed the following limits:

SNO	Item	% of wastage on issued qty
1	Fabricated steel	2
2	Each size of Power Cables	1
3	GI /MS Pipes	1
4	ACSR conductors	2

8. 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.

NOTE:

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

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

6.19.0 TERMS OF PAYMENT

The contractor shall submit his monthly on account monthly bill with all details 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.

No advance payment will be made.

For Engineering :

- A) Preparation of drawings and obtaining statutory clearances etc.,**

- a. On completion of preparation of drawings and obtaining approvals and statutory clearances etc., 95%
- b. On submission and passing of final bill 5%

For **Supply and erection** work progressive payment up to 95 % shall be released, prorata ,on monthly bills as certified by BHEL Engineer.

Balance 5 % amount shall be released after the guarantee period.

B) Supply of Materials.

- a. On receipt of material, verification of documents and on acceptance at site on pro-rata basis 75%
- b. On charging on pro-rata basis 20%

C) Fabrication & Installation of support structures, Gates etc.,

- a. On fabrication & Erection on pro-rata basis 80%
- b. On completion of painting 15%

D) Erection and Commissioning of Transformers/ Kiosks and other Hardware items

- a. Receipt, transport to the placement of erection Placement, assembly, alignment, grouting, mounting and wiring loose parts, as applicable on pro rata basis 75%
- b. Oil filling/filtration/Pre commissioning checks/tests/ Energisation and commissioning as applicable on pro rata basis 20%

E) Erection/Construction of Transformer Foundation, Earth Pits, Fencing, gate, levelling with supply of materials ,

Brick work etc as per rate schedules of 11/.415KV Sub Station.

- | | | |
|----|--|-----|
| a | On completion on pro rata basis | 90% |
| b. | On completion of finishing works like painting, testing as applicable and completion of all pending points | 5% |

F) Erection of any other item, not covered above, the terms of payment shall be as follows

- | | | |
|----|-------------------------------|-----|
| a. | On Erection on pro rata basis | 75% |
| b. | After completion of work | 20% |

G) Payment for O&M portion shall be payable on submission of monthly running Bills at the quoted/accepted monthly charges and as certified by BHEL engineer subject to standard deductions.

H) The last 5 % Guarantee amount is payable after the guarantee period of 12 months. However this 5 % amount can be released against submission of matching Bank Guarantee valid for the entire guarantee period.

6.20.0 ELECTRICAL INSPECTORATE'S APPROVAL:

1. All electrical installation covered in contractor's scope are to be inspected/approved by the electrical inspector/statutory authority. For getting electrical inspector's approval, contractor shall arrange the following:
 - Completion certificate for all the equipment covered in the contract
 - Copy of Test results conducted at site
 - All other documents as required by statutory authority.
2. Contractor shall carry out the modifications/rectifications if any as suggested by the statutory authority at his cost.

3. Contractor shall also have valid electrical installation license on his company as well as for individuals acceptable to the respective state electrical inspectorate.
4. 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.

6.21.0 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 checklist.

Tenderers shall go through very carefully all the clauses and submit manpower deployment plan, list of T&P and instruments that are available with him for mobilisation for the work as specified above.

Apart from other details called for in the tender document under the various other provisions, the tenderers along with technical bid shall submit the following details.

- a. HQ Organisation chart
- b. Site Organisation Chart Covering various functions
- c. Month wise Manpower deployment plan
- d. T&P deployment plan
- e. Erection Schedule.
- f. A copy of Electrical license

6.22.0 DRAWINGS AND DOCUMENTS

The technical details and drawings of the equipments and systems given in this tender specification are only for guidance and only indicative of the requirement. The contractor shall take note of all the aspects of technical details furnished while arranging the required equipments/ materials/services as the case may be.

Contractor shall prepare detailed drawings and get the same approved by BHEL and CIEG of Tamil nadu as the case may be. Detailed execution drawings for 11 kV Ring Main shall be submitted to BHEL within a week of award of fax LOI for approval of TNEB. Detailed drawing of 500 kVA Substations (Layout Plan, Equipment Detailed drawing etc.) shall be submitted within two weeks of fax LOI for approval by BHEL. Contractor shall prepare As-Built Drawing for 11 kV system and equipments incorporating the statutory requirements as per Indian Electricity rules and the location of poles, DP structures, earthing, cables etc., the layout and route of 11 kV Ring Main. If any error or ambiguity is discovered in the specification/ information contained in the documents/drawings and tender, the contractor shall immediately bring the same to the notice of BHEL before commencement of the work. BHEL's interpretation in such cases will be final and binding on the contractor.

The following information shall be furnished within two weeks of award of contract for approval:

- a) Final field quality plan
- b) Bar chart covering planned activities at site
- c) Detailed organization chart

The following information shall be furnished after testing and inspection:

- a) Test certificates of various tests conducted at site.
- b) As built drawings:

6.23.0 EXTRA CHARGES FOR MODIFICATION AND RECTIFICATION

If extra works (requiring less than 20 man-hours) for modification, rework, revamping, in brief, any work done to change the state existing to a stage desired and also fabrication, all or any, are needed due to any change in or deviation from the drawings and design of equipment, operation/ maintenance requirements,

mismatching, transit damages and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, are done, no extra charges will be paid. The bidders are requested to take this aspect into account and the quoted rate should cover all such contingencies.

It may also be noted that if any such said extra works arise on account of the contractor's fault it will have to be carried out by the contractor at no extra cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.

However, BHEL may consider for payment as extra, for such of those works detailed which require more than 20 man hours and such payment will be regulated by the terms, conditions and stipulations contained in the CC of the Tender. It may be specifically noted that the decision of BHEL as to whether such payment is due shall be final and binding on the contractor

The following man hour rates will be applicable for modification/rectification work.

Average single man hour rate including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, including consumables for carrying out any rework, re-vamping as may arise during the course of erection **Rs.40/- man hour.**

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.**

BHEL may, at their absolute discretion, consider for payment as extra on man day basis for such of those works which require major modification, major repair, major reworks, major rectification etc., as found by them as justifiable. It may be noted that only those works, which are identified as major and warrant extra payment and certified as such by the project manager and accepted by the designers and/or competent authority of BHEL, will be considered for extra payment.

A separately identified gang shall carry out the extra works. No diversion of regular gang for such extra works will be permissible and no delay or slow progress should be caused due to executing extra works. Hence, the question of granting extension of time for this reason should not arise. Daily log sheets in the pro forma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered/ entertained in the absence of the said supporting documents i.e. Daily log sheets. It may, however, be noted that signing of log sheets by BHEL engineer does not mean the acceptance of such works as extra works eligible for payment of the acceptance of number of man days needed for the work. Also contractor shall complete the extra work done regularly and submit the same within 30 days after completion of extra work.

BHEL retains the right to award or not to award any of the major repair/ major rework/ major modification/ major rectification/ major fabrication works under clauses CC to the contractor, at their discretion without assigning any reason for the same. After eligibility of extra works is established and finally accepted by BHEL engineer/designer, payment will be released on competent authority's approval at the following rate.

6.24.0 Taxes and Duties

Value Added Tax (VAT)

Price quoted shall be inclusive of VAT except service tax.

For the purpose of VAT 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 to be supplied by him, consumables, spares etc., inter alia indicating the name of the supplier, address and VAT Registration No. and VAT paid for the purchases, etc.,

The bidder shall get registered with State VAT authorities and the registration certificate shall be forwarded to BHEL immediately after commencement of work. In case the bidder had already registered under respective State VAT, they must quote their registration Number and forward copy of Registration Certificate while submitting this tender. The bidder has to obtain VAT clearance certificate from the concerned authorities, on completion of work and submit along with the final bill as one of the documents for contract closure.

In case the Bidder decides to include any VAT element along with the quoted price, they shall specify (1) The value of VAT included in the quote, (2) the rate of VAT adopted and (3) On what value etc., as additional information, in the price bid. If no VAT element is included in the price, the same shall be indicated in the quote.

The bidder shall quote very competitive price after taking into consideration of above points.

SERVICE TAX

Price quoted shall be exclusive of Service Tax. The service tax as statutorily leviable and payable by the bidder under the provisions of service tax Law / Act shall be paid by BHEL as per bidder claim through various running bills. **The bidder shall furnish proof of service tax registration with Central Excise Department specifying the name of services covered under this contract.** Registration Certificate should also bear the endorsement for the premises from where the billing shall be done by the bidder on BHEL for this project. The bidder shall obtain prior consent of BHEL before billing the service tax amount.

OTHER TAXES & LEVIES

Any other taxes and duties (except VAT & Service Tax) viz. Entry Tax, Octroi, Seigniorage, Licenses, Deposits, Royalty, Stamp Duty, other charges / levies, etc., prevailing / applicable on the date of opening of technical bids and any variation thereof during the tenure of the contract are in the scope of bidder. In case BHEL is forced to pay any such taxes, BHEL shall have the right to recover the same from the bidder either from running bills or otherwise as deemed fit.

NEW LEVIES / TAXES

In case Government imposes any new levy / tax after award of the work during the tenure of the contract, BHEL shall reimburse the same at actual on submission of documentary proof of payment subject to the satisfaction of BHEL that such new levy / tax is applicable to this contract.

STATUTORY VARIATIONS :

Statutory variations are applicable only in the cases of Value Added Tax and Service Tax. The changes implemented by the Central / State Government in the VAT Act / Service Tax during the tenure of the contract viz. increase / decrease in the rate of taxes, applicability, etc., and its impact on upward revision / downward revision are to be suitably paid/ adjusted from the date of respective variation. The bidder shall give the benefit of downward revision in favour of BHEL. No other variations shall be allowed during the tenure of the contract including extended period, if any.

DIRECT TAXES

BHEL shall not be liable towards Income Tax of whatever nature including variations thereof arising out of this contract as well as tax liability of the bidder and their personnel. Deduction of tax at source at the prevailing rates shall be effected by BHEL before release of payment as a statutory obligation, unless exemption certificate is produced by the bidder. TDS certificate will be issued by BHEL as per the provisions of Income Tax Act.

IMPORTANT CONDITIONS FOR PAYMENT

It may be noted that the first running bill will be released only on production of the following.

1. PF Regn. No.
2. Labour Licence No.
3. Workmen Insurance Policy No.
4. Un Qualified Acceptance for Detailed L.O.I.
5. Initial 50% Security Deposit.
6. Rs. 100/- Stamp Paper for Preparation of contract agreement

All payments due to the contractor shall be made either through "e-Payment" or Account Payee cheque only . The tenderer has to furnish details of his Bank account as certified by the concerned Banker in the format furnished to enable e-payment.

FORM TO BE FILLED BY VENDORS FOR REGISTERING FOR E-PAYMENT

Details of Bank Account details of Contractor for remittance of e-Payment

1	NAME & ADDRESS OF THE CONTRACTOR / SUPPLIER	:	
2	BANK A/C NO.	:	
3	TYPE OF A/C (CC / CURRENT)	:	
4	NAME OF THE BANK	:	
5	NAME OF THE BRANCH	:	
6	BRANCH CODE	:	
7	BANKER'S ADDRESS (BRANCH)	:	
8	MICR NO.	:	
9	IFSC CODE	:	

Note : THE ABOVE DETAILS ARE TO BE FURNISHED IN THEIR LETTER HEAD BY THE CONTRACTOR / SUPPLIER, DULY ATTESTED BY THEIR BANKERS.

PROVIDENT FUND & MINIMUM WAGES

The contractor is required to extend 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.

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.

The final bill amount would be released only on production of clearance certificate from PF/ESI and labour authorities as applicable.

OTHER STATUTORY REQUIREMENTS

- 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 alongwith the **first** running bill.

- 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.
- 3 The Contractor should ensure compliance of Sec 21 of Contract Labour (R&A) Act 1970 regarding responsibility for payment of Wages. In case 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.
- 4 The Contractor shall submit copies of Final Settlement statement of disbursement 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 Act 1948 (If applicable) to BHEL along with the Final Bill.
- 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 In case 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.

Annexure –VI A

T & P TO BE PROVIDED BY BHEL FREE OF CHARGE

Subject to availability, BHEL shall provide EOT cranes for the purpose of shifting the panels with in the PH building on sharing basis at free of cost. However, the contractor shall arrange operator and other T & P

Annexure -B

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
		Resistance (Hcl) 2120 200* to 200M*	$\pm 0.5\%$ + 1 digit
		Resistance (Hcl) 2105 200* to 200M*	$\pm 0.25\%$ + 1 digit
		Hcl Voltage 200mA to 750 V	$\pm 0.8\%$ + 1 digit
		Philips Current 20 mA to 20 A DC	$\pm 0.5\%$ + 1 digit
		Hcl Current 200 mA to 010 A AC	$\pm 1\%$ + 1 digit
4	Vibration Measuring Equipments	Velocity upto 50 mm/sec.	$\pm 0.5\%$ mm/sec
		Displacement upto 300 microns	± 2 microns
5	Secondary Injection Kit	Upto 5A	$\pm 0.5mA$

6	Motor operated Megger	Upto 200 Ohms	$\pm 5\%$ at Centre scale
7	Tongue tester	0/300/600A AC	$\pm 5\%$
		0 to 300A DC	$\pm 5\%$
8	Tachometer (Hand held)	0 to 4000 rpm	$\pm 5\%$
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	$\pm 5\%$ at Centre Scale $\pm 10\%$ at end of Scale
14	Motorised Megger 2.5 KV	Upto 200 M Ohms	$\pm 5\%$ at Centre Scale $\pm 10\%$ at end of Scale
15	Earth Megger (Tester)	0 to 1, 10, 100 Ohms	$\pm 5\%$ at Centre Scale range
16	AC tongue Tester	0 to 300A AC	$\pm 3\%$
17	DC Tongue Tester	0 to 300A DC	$\pm 5\%$
18	High Voltage test Kit	Upto 50 KV AC	$\pm 10\%$
		Upto 70 KV DC	$\pm 10\%$
19	Tacho Generator (Mech)	0 to 4000 rpm	$\pm 0.25\%$
20	DC Ammeter	0 to 300 A	$\pm 10\%$
21	DC Voltmeter	0 to 500 V	$\pm 10\%$

OTHER REQUIREMENTS OF CONTRACTORS' INSTRUMENTS T&P

- 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 other than propriety type T&P/Instruments for the successful completion of this job shall 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 shall be sent for testing and calibration wherever from time to time and maintained by contractor as required by BHEL.
- f. List of such agencies and periodicity of calibration required for different instruments shall be furnished by BHEL at site.
- i. Contractors shall arrange experienced/qualified persons for using these calibration instruments at laboratory and also at work spot. Wherever frequent calibration is required, contractor shall arrange adequate number of instruments such that the work does not suffer for want of test instruments.

APPENDIX - VI C

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	HP Welders	
07	Structure Welders	
08	TIG welders	
09	Electricians	
10	Store Keeper	
11	Semi skilled and unskilled workers	
12	Watchman/Security	

NOTE

01. Minimum Number of persons to be indicated month wise.
02. Above deployment plan shall be discussed with BHEL Site Engineer and necessary changes shall have to be made by the contractor as per discussion. If required, any additional deployment during execution of the work shall have to be arranged by the contractor for meeting various schedules/targets set by BHEL without any additional compensation.
03. Resident Engineer 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. Lab Technicians should have experience in Thermal Power Stations.
06. Contractor should have one Store Keeper and one Transport Supervisor for the safe transportation of materials.

APPENDIX - VI D

DEPLOYMENT PLAN FOR MAJOR TOOLS AND PLANTS / INSTRUMENTS

S.NO	CATEGORY	MONTHS	PRESENT LOCATION
		1 2 3 4 5 6 & SO ON	
01	Welding Generators		
02	Welding Transformer		
03	TIG Welding sets (air cooled)		
04	Insulation Tester a. Motorized Megger 1000 & 5000 V Grade b. Hand operated Megger 500 & 1000 V Grade		
05	Earth resistance Megger		
06	Transformer oil testing kit		
07	Torque wrench		
08	Volt Meter/Ammeter/ Avometer/other instrument		
09	Multimeter/Test lamps/ Field telephone sets/ different gauges		
10	High vac steam line filter of 6000/4500 LPHfor transformer dryout		

S.NO	CATEGORY	MONTHS	PRESENT
		1 2 3 4 5 6 & SO ON	LOCATION
11	3 phase/Single phase Variac 15 Amps		
12	Primary and Secondary Injection testing kits.		
13	HV test kit		
14	Resistance measurement unit		
15	Oscilloscope		
16	5 Amps DC Power Supply unit		
17	Crimping Tools with various sizes of dyes.		

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 shall be discussed with the site engineer and necessary changes shall have to be made by the contractor as per discussions. If required, an additional deployment during execution of work shall 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 :

SI.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

GENERAL TECHNICAL REQUIREMENT

7.0.0 RATING PLATES, NAME PLATES AND LABELS

Each main and auxiliary item of substation is to have permanently attached to it in a conspicuous position a rating plate of non-corrosive material upon which is to be engraved manufacturer's name year of manufacture, equipment name, type or serial number together with details of the loading conditions under which the item of substation in question has been designed to operate, and such diagram plates as may be required by the Purchaser. The rating plate of each equipment shall be according to IEC requirement.

All such nameplates, instruction plates, rating plates shall be bilingual with English.

7.1.0 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, creases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible, shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or other wise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by

abrasion due to normal handling. All external painting shall be as per shade No. 631 of IS:5.

7.1.1 GALVANISING:

All ferrous parts including all sizes of nuts, bolts, Plain and spring washers, support channels, structures, shall be hot dip galvanised conforming to latest version of IS:2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electro-galvanized. Minimum weight of zinc coating shall be 610 gm/sqmm and minimum thickness of coating shall be 85 microns for all items thicker than 6mm. For items lower than 6 mm thickness, requirement of coating shall be as per relevant ASTM.

7.1.2 CLAMPS AND CONNECTORS

All power clamps and connectors shall conform to IS:5561 & NEMA CC1 and shall be made of materials listed below:

a	For connecting ACSR conductors	Aluminium alloy casting conforming to designation A6 of IS:617 and shall be tested for all tests as per IS:617
b	For connecting equipment terminals made of copper with ACSR conductors	Bimetallic connectors made from aluminum alloy casting, conforming to designation A6 of IS 617 with 2mm thick bimetallic liner and shall be tested as per IS:617
c	For connecting G.I shield wire	Galvanised mild steel / malleable non casting
d	Bolts nuts & plain, washers	Electrogalvanised for sizes below M-12 for others hot dip galvanised
	Spring washers for items 'a' to 'c'	Electro-galvanised mild steel suitable for at least service condition-3 as per IS-1573

Each equipment shall be supplied with the necessary terminals and connectors, as required by the utility design for the particular installation. The conductor terminations of equipment shall be either expansion. The requirement regarding external corona and RIV as specified for any equipment shall include its terminal fittings and the equipment shall be factory tested with the connectors in position. If corona rings are required to meet these requirements they shall be considered as part of that equipment and included in the scope of work.

Where copper to aluminum connections are required, bimetallic clamps shall be used, which shall be properly designed to ensure that any deterioration of the connection is kept to a minimum and restricted to parts which are not current carrying or subjected to stress. The design details of the joint shall be furnished to the purchaser by the Contractor.

Low voltage connectors, grounding connectors and accessories for grounding all equipment as specified in each particular case, are also included in the scope of Work.

No current carrying part of any clamp shall be less than 10 mm thick. All ferrous parts shall be hot dip galvanised. Copper alloy liner of minimum 2 mm thickness shall be used with aluminum body for Bimetallic clamps.

All casting shall be free from blowholes, surface blisters, cracks & cavities. Sharp edges and corners shall be blurred and rounded off.

Flexible connectors, braids or laminated straps made for the terminal clamps for bus posts shall be suitable for both expansion or through (fixed/sliding) type connection of 4" IPS Al tube as required. In both the cases the clamp height (top of the mounting pad to centre line of the tube) should be same.

Clamp shall be designed to carry the same current as the conductor and the temperature rise shall be equal or less than that of the conductor at the specified ambient temperature. The rated current for which the clamp/connector is designed with respect to the specified reference ambient temperature, shall also be indelibly marked on each component of the clamp/connector, except on the hardware.

All current carrying parts shall be designed and manufactured to have minimum contact resistance.

7.1.3 ENGINEERING DATA

The furnishing of engineering data by the contractor shall be in accordance with the Schedule for each set of equipment as specified in the Technical Specifications.

The review of these data by the purchaser will cover only general conformance of the data of the specifications and document, interfaces with the equipment provided under the specifications, external connections and of the dimensions which might effect substation layout. This review by the purchaser may not indicate thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicated or the accuracy of the information submitted. This review and / or approval by the purchaser shall not be considered by the Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements specified under these specifications and documents.

All engineering data submitted by the Contractor after final process including review and approval by the purchaser shall form part of the Contract Document.

7.1.4 DESIGN

The Contractor shall be responsible for the selection and design of appropriate equipments to provide the best co-ordinated performance of the entire system. The basic design requirements are detailed out in this Specification. The design of various components, sub-assemblies and assemblies shall be so done that it facilitates easy field assembly and maintenance

7.1.5 INSTALLATION

All the equipment shall be installed in accordance with the specific installation instructions as shown on manufacturer's drawings or as directed by the purchaser. Equipment shall be installed in a neat, workmanlike manner so that it is level, plumb, square and properly aligned and oriented. Commercial use of equipment means completion of all site tests specified and Energisation at rated voltage. The words erection and installation used in the specification are synonymous.

Exposed live parts shall be placed high enough above ground to meet the requirements of electrical and other statutory safety codes. The minimum phase to earth, phase to phase and section clearance along with other technical parameters for the various voltage levels to be maintained shall be strictly as per the approved drawings.

7.1.6 CLEARANCES AND SPACINGS

Clearance between lines of different voltages on same or independent supports:

Between 66, 33, 22, 11 kV, LT or telephone lines and 66 kV line
: 2.44 m

Clearance from supporting structures of another line

Low or medium voltage lines : 1.22 m

High voltage line : 1.83 m

Clearance between lines and guard wires

Where used, guard wires shall have an actual breaking load of not less than 635 kg and made of iron or steel shall be galvanized.

The earth should be efficiently maintained and the earth resistance should not exceed 20 ohm.

7.1.7 TESTING AND COMMISSIONING

Prior to commissioning and energizing of system, following tests shall be carried out:

Insulation Resistance measurement.

High Voltage test on HT cables.

Earth Resistance Test

Mechanical Checks of Overhead lines and all associated components.

Visual inspection for any looseness and cracks in the insulators and at terminal ends.

Minimum clearance checks between earth to live parts, phase to phase and line to nearest conducting materials .

The H.T. cables after meggering shall be tested by H.V. Test and continuity test before charging.

Any other check/test necessary to ensure desired quality of installation as per Codes

and FQP and safe operation of the system

7.1.8 STANDARDS AND CODES

The works covered by the specification shall be designed, engineered, manufactured, built, tested and commissioned in accordance with the Acts Rules, Laws and Regulations of India.

The equipment to be furnished under specification shall conform to latest issue with all amendments of standard specified herein as well as under respective Sections of the specification.

In addition to meeting the specific requirement called for in the respective sections of the Technical Specification, the equipment shall also conform to the general requirement of the relevant standards which shall form an integral part of the specification.

The contractor shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves, but intended to compliment each other.

The Contractor shall also note that list of standards presented in this specification is not complete. Whenever necessary the list of standards shall be considered in conjunction with specific IS/IEC.

When the specific requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation to the specification shall take precedence.

Other internationally accepted standards which ensure equivalent or better performance than that specified in the standards referred shall also be accepted. Copies of such standards shall be submitted by the contractor.

In case governing standards for the equipment is different from IS or IEC, the salient points of difference shall be clearly brought out along with English language version of standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Purchaser's approval.

7.1.9 LIST OF STANDARDS- INDIA ELECTRICITY RULES

Standard No	Description
IS-1448 (P1 to P 145)	Methods of test for petroleum and its products
IS-2071 (P1 to P3)	Methods of High Voltage Testing
IS-12063-1987	Classification of degrees of protection provided by enclosures of electrical equipment
IS-2165 P1:1997 (Reaffirmed 1991)	Insulation Coordination
IS-3043 (Reaffirmed 1991)	Code of Practice for Earthing
IS-6103 (Reaffirmed 1990)	Method of Test for Specific Resistance (Resistive of Electrical Insulating Liquids)
IS-6104 (Reaffirmed 1990)	Method of Test for Interfacial Tension of Oil against Water by the Ring Method
IS-6262 (Reaffirmed 1991)	Method for determination of electric strength of insulating oils
IS-6792 (1992)	Method for determination of electric strength of insulating oils
IS-5578: (1993)	Guide for marking of insulated conductors
IS-11353: 1985 (Reaffirmed 1991)	Guide for uniform system of marking & identification of conductors & apparatus terminals

Standard No	Description
IS-8263 (Reaffirmed 1990)	Methods for Radio Interference Test on High voltage Insulators
IS-9224 (Part 1,2 & 4)	Low Voltage Fuses
IEC-60 (Part 1 to P4)	High Voltage Test Techniques
IEC-117	Graphical Symbols
IEC-156, 1963	Method for the determination of the Electrical Strength of Insulation Oil
IEC-270, 1989	Partial Discharge measurements
IEC-437, 1973	Radio interference Test on High Voltage Insulators
IEC-506, 1975	Switching Impulse Tests on High Voltage Switchgear & Control gear Standards
IEC-507, 1991	Artificial Pollution Tests on High Voltage Insulators to be used on AC Systems
IEC-694, 1996	Common Specification for High Voltage Switchgear & control gear Standards
IEC-815, 1986	Guide for the Selection of Insulators in respect of Polluted Conditions.

Standard No	Description
IEC-865 (1994) (P1 & P2)	Short Circuit Current – Calculation of effects
ANSI-C1/NFPA70	National Electrical Code
ANSI-C37-90A	Guide for Surge Withstand Capability (SWC) Tests
ANSI-C6321, C63.3, C36.4	Specification for Electromagnetic Noise and field strength Instrumentation 10 KHz to 1 GHZ
ANSI-C68.1	Techniques for Dielectric Tests
ANSI-C76.1/EEE21	Standard General Requirements and Test Procedure for Outdoor Apparatus Bushings
ANSI-Y32-2/C337.2	Drawing Symbols
CSA-Z299.1-1978h	Quality Assurance Program Requirements
CSA-Z299.2-1979h	Quality Control Program Requirements
CSA-Z299.3-1979h	Quality Verification Program Requirements
CSA-Z299.4-1979h	Inspection Program Requirements

Standard No	Description
IS-10028 (Part 2 & 3)	Code of practice for selection, installation & maintenance of Transformers (P1:1993), (P2:1991), (P3:1991)
IS-2026 (P1 to P4)	Power Transformers
IS-3347 (part 1 to part 8)	Dimensions for Porcelain transformer Bushings for use in lightly polluted atmospheres
IS-3639 (1991)	Fittings and Accessories for Power Transformers
IS-6600 (1991)	Guide for Loading of Oil immersed Transformers
IEC-76 (part 1 to part 5)	Power Transformers
IEC-214 (1989)	On-Load Tap-Changers
IEC-354 (1991)	Loading Guide for Oil – Immersed power transformers
IEC-551 (1995)	Determination of Transformer and Reactor Sound Levels
ANSI-C571280	General requirements for Distribution Power and Regulating Transformers
ANSI-C571290	Test Code for Distribution, Power and Regulation Transformers
ANSI-C5716	Terminology & Test Code for Current Limiting Reactors

Standard No	Description
ANSI-C5721	Requirements, Terminology and Test Code for Shunt Reactors Rated Over 500 KVA
ANSI-C5792	Guide for Loading Oil-Immersed Power Transformers upto and including 100 MVA with 55 deg C or 65 deg C Winding Rise
ANSI-CG, 1EEE-4	Standard Techniques for High Voltage Testing
NEMA-TR-1	Transformers, Regulators and Reactors
IS-2099 (1992)	Bushings for Alternating Voltage above 1000V
IEC-137 (1995)	Insulated Bushing for Alternating voltages above 1000V
IS-3070 (PART2) (1993)	Lighting arresters for alternating current systems: Metal oxide lightning arrestors without gaps.
IEC99-4	Metal oxide surge arrestors without gaps
NEMA-LA-1	Surge Arresters
S-722, IS-1248, IS-3231, 3231 (P-3)	Electrical relays for power system protection
S:5039 (1991)	Distributed pillars for Voltages not Exceeding 1000 volts
EC-68.2.2 (1994)	Basic environmental testing procedures Part 2: Test B Dry heat
IEC-529 (1989)	Degree of Protection provided by enclosures.

Standard No	Description
IEC-158 (upto P3-1985)	Low Voltage Control Gear Contactors
IEC-439 (P1 & 2)	Low Voltage Switchgear and control gear assemblies
ANSI-C37.20	Switchgear Assemblies, including metal enclosed bas
ANSI-C3750	Test Procedures for Low Voltage Alternating Current Power Circuit Breakers
ANSI-C39	Electric Measuring instrument
ANSI-C83	Components for Electric Equipment
IS:8623: (Part 1 to 3: 1993)	Specification for Switchgear & Control Assemblies
NEMA-PB-1	Panel Boards
IEC-129 (1992)	Alternating Current Disconnectors (Isolators) and Earthing switches
IEC-265 (Part 1 1994)	High Voltage Switches
ANSI-C37.32	Schedule of preferred ratings, Manufacturing Specifications and Application Guide for high voltage Air Switches. Bus supports and switch accessories

Standard No	Description
ANSI-C37.34	Test Code for high voltage air switches
NEMA-SG6	Power switching equipment
IEC-255 (Part 1 to Part 23)	Electrical relays
IEC-297 (P1 to P4 : 1995)	Dimensions of mechanical structures of the 482.6 mm (19 inches) series
IEC-359 (1991)	Expression of the performance of electrical & electronic measuring equipment.
IEC-521 (1988)	Class 0.5, 1 and 2 alternating current watt hour metres

7.1.10 MATERIAL AND WORKMANSHIP STANDARDS

1. IS-1363 (P1 to P3 1992)-Hexagon head bolts, screws and nuts of product grade C.
2. IS-1364 (P1 to P5 1992)-Hexagon head bolts, screws and nuts of products grades A and B.
3. IS-3138 (1991)-Hexagonal Bolts and Nuts (M42 to M150)
4. ISO-898-Fasteners: Bolts, Screws and studs,

Clamps & Connectors

1. IS-5561 (1992)-Electric power connectors.
2. NEMA-CC1-Electric Power connectors for sub station
3. NEMA-CC3-Connectors for Use between aluminum or aluminum-Copper Overhead Conductors

Bus Hardware And Insulators

1. IS: 2121 (1991)-Fittings for Aluminum and steel cored aluminum conductors for overhead power lines.
2. IS-731 (1991)- Porcelain insulators for overhead power lines with a nominal voltage greater than 1000 V.
3. IS-2486 (P1 to P4)-Insulator fittings for overhead power lines with a nominal voltage greater than 1000 V.
4. IEC-120 (1984)-Dimensions of Ball and Socket Couplings of string insulator units.
5. IEC-137 (1995)-Insulated bushings for alternating voltages above 1000 V.
6. IEC-168 (1994)-Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V.
7. IEC-233 (1988)-Tests on Hollow insulators for use in electrical equipment.
8. IEC-273 (1990)-Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1000V.
9. IEC-305 (1995)- Insulators for overhead lines with nominal voltage above 1000V-ceramic or glass insulator units for a.c. systems Characteristics of String Insulators Units of the cap and pin type.
10. IEC-372 (1984)-Locking devices for ball and socket couplings of string insulator units: dimensions and tests.
11. IEC-383 (P1 and P2-1993)-Insulators for overhead lines with nominal voltage above 1000 V.

12. IEC-433 (1980)-Characteristics of string insulator units of the long rod type.
13. IEC-471 (1977)-Dimensions of Clevis and tongue couplings of string insulator units.
14. ANSI-C29.1-Test methods for electrical power insulators
15. ASTM A-153-Zinc Coating (Hot-Dip) on iron and steel hardware

7.1.11 STRAIN AND RIGID BUS-CONDUCTOR

1. IS-2676 (1992)-Dimensions & tolerances for Wrought Aluminum and Aluminum Alloys drawn round tube.
2. ASTM-B 230-82-Aluminum 1350 H19 Wire for electrical purposes
3. ASTM-B 231-82-Aluminum 1350 H19 Wire for electrical purposes
4. ASTM-B 236-83-Aluminum bars for electrical purpose (Bus-bars)
5. ASTM-B 317-83-Aluminum-Alloy extruded bar, rod, pipe and structural shapes for electrical purposes (Bus Conductors)

7.1.12 GALVANIZING

1. IS-209 (1992) -Zinc Ingot
2. IS-2629 (1990)-Recommended Practice for Hot-Dip galvanizing on iron and steel.
3. IS-2633 (1992)-Specification for zinc (Hot Galvanizing) Coatings on products Fabricated from rolled pressed and forged steel shapes, plates, bars and strips.
4. ASTM-A-153-Specification for Zinc Coating Hot Dip) on iron and steel hardware.
5. ASTM-A-239-Test method for locating the thinnest spot in a zinc

(Galvanized) coating on Iron C+ steel articles by the preece test (Copper sulfated dip).

6. ASTM-A-121-77-Zinc-coated (Galvanized) steel barbed wire-

7.1.13 PAINTING

1. IS-6005 (1991)-Code of practice for phosphating of iron and steel.
2. ANSI-Z551- Gray finishes for industrial apparatus and equipment
3. SSPEC-Steel structure painting council

7.1.14 STEEL STRUCTURES

1. IS-228 (1992)- Method of Chemical Analysis of pig iron, cast iron and plain carbon and low alloy steel.
2. IS-808 (1991)- Dimensions for hot rolled steel beam, column channel and angle sections.
3. IS-814 (1991)- Covered electrodes for manual arc welding of carbon of carbon manganese steel.
4. IS-816 (1992)- Code of practice for use of metal arc welding for general construction in mild steel.
5. IS-1363 (P1 to P3 1992)-Hexagonal head bolts, screws & nuts of products grade
6. IS-1364 (1992)-Hexagon headbolts, screws and nuts of product grades A and B.
7. IS-2062 (1992)-Steel for general structural purposes.
8. IS-7205 (1991)-Safety code for erection of structural steel work.

9. ASTM-A36-Specifications of structural steel
10. ASTM-A143- Practice for safeguarding against embilement of Hot Galvanized structural steel products and procedure for detaching embrilement
11. NSI-B18.21.1-Lock washers
12. ANSI-B18.21.2-Plain washers

7.1.15 ACSR CONDUCTOR

Indian Standard	Title	International Standard
IS:6745 (1990)	Methods for Determination of coated iron and steel articles	BS:443-1969
IS:398 (1992)	Aluminium Conductors for Overhead transmission purposes	IEC:209-1966
Part - V (1992)		BS:215
IEC: 209-1966	Aluminium conductors galvanised	BS: 215(Part-II)
1970steel reinforced extra high voltage (400 kV and above)		
IS: 1778-1980	Reels and drums for Bare conductors	BS: 1559-1949
IS: 1521 (1991)	Method for Tensile Testing of steel wire	1. ISO/R89-1959

7.1.16 GALVANISED STEEL EARTH WIRE

Indian Standard	Title	International Standard
IS: 1521 (1991)	Method for tensile testing of Steel Wire	ISO/R-89-1959
IS: 1778 (1980)	Reels and drums for bare conductors	
IS: 2629 (1990)	Recommended practice for hot dip galvanizing on iron and steel	
IS: 4826 (1992)	Hot dip galvanised coatings	ASTM: A 475-72a on round steel wires, BS: 443-196
IS:398	(Pt. 1 to Aluminium conductors for BS:215 (Part-II)P5:1992)	

7.1.17 LIGHTING FIXTURES AND ACCESSORIES

1. IS: 1913 General and safety requirements for electric lighting fittings
2. IS:3528 Water proof electric lighting fittings
3. IS:4012 Dust proof electric lighting fittings.
4. IS:10322 Specification for flood light.
5. IS:2418 Tubular fluorescent lamps
6. IS:9900 High pressure mercury vapour lamps.
7. IS:1258 Specification for Bayonet lamp fluorescent lamp.

7.2.0 LIST OF MAJOR TOOLS AND TACKLES / INSTRUMENTS RECOMMENDED.

7.2.1 The following minimum testing equipments/T&P are recommended

TESTING EQUIPMENTS

SNo	Description	Qty
1	Single Phase Variac 250 V; 10A	1 No
2	Three Phase Variac 415 V	1 No
3	Tong tester Ac 25/60/300/600 Amps; KEW Snap Make	1 No (Each)
4	Secondary Injection Kit	1 No
5	Motorised Megger 45/5 KV:0-25000 M Ohms	1 No
6	Hand Operated Megger 500V:2.5 KV/100 M Ohms	Each type as required
7	Earth Resistance tester 0 -1: 10: 100 ohms	As required
8	Torque wrench	As required
9	AC Voltmeter 0-125:250; 625 V	1 No (Each)
10	AC Ammeter 0-2A, 10A	1 No (Each)
11	Analog Multimeter Motwane Make	4 Nos
12	Digital Multimeter 3 1 / 2 Digit	4 Nos
13	Digital Multimeter 4 1/ 2 Digit	02 Nos

14	HV test kit – 50 KV AC	01 No
15	Phase Sequence meter	01 No
16	Soldering irons, soldering pump, Vacuum cleaner, Air blower etc.	01 No
17	Transformer oil kit	As required

7.2.2 MAJOR T & P

SNO	DESCRIPTION	QTY
1	Steel Wire Ropes	As per requirement
2	Chain Pulley Block/ Turfer	- do -
3	Grinding Machine	- do -
4	Drilling Machines 1/4:", 1/ 2",3/4", & 1	- do -
5	Dye sets for Threading upto 2" Pipe	- do -
6	Set of spanners	- do -
7	Allenkey sets	- do -
8	Bench Vice	1 No
9	Spirit Level	As required
10	Tap sets for both BSP and NPT Threads upto 1"	1 set each
11	Welding Transformer	As required

12	Mechanical Tool Kit for fitters	- do -
13	Crimping Tool upto 2.5 Sq. MM cable + Hyd. Operated	- do -
14	Flood light fittings	- do -
15	Fire Extinguishers	- do -
16	Distribution boards with power cable Complete as required	- do -
17	Painting brush	- do -
18	Fire proof tarpaulin	- do -
19	Safety belts and safety helmets	- do -
20	Telephone sets	- do -
21	High vacuum oil filtering Machine of 1000 LPH	01 No

7.2.3 GENERAL REQUIREMENT OF CONTRACTOR'S INSTRUMENTS / EQUIPMENTS

- a) The contractor shall arrange all the above. T&P, equipment and instruments as indicated.
- b) Any other tools and plants instruments and equipments required in addition to the above for the successful completion of this job will have to be arranged by the contractor at their cost.
- c) Necessary accessories for the above shall also be provided by the contractor.

- d) The above instruments/equipments will be sent for testing and calibration wherever from time to time and maintained by contractor as required by BHEL.
- e) All testing instruments shall have calibration certificate issued by recognized/accredited agencies.
- f) List of such agencies and periodicity of calibration required for different instruments will be furnished by BHEL at site.
- g) Contractor shall maintain calibration records as per the format CP:FE:FOZ enclosed in the Tender Specification and produced whenever called for by BHEL Engineers.

7.2.4 REFERENCE DRAWINGS:

1. Typical Arrangement of 500 KVA 11KV/415V Substation:
Drawing No. 2-AMK-TYP-003 Rev 0
2. Typical Schematic Arrangement of 11KV/415V Substation:
Drawing No. 3-AMK-TYP-004 Rev 00

**RECOMMENDED LIST OF TOOLS AND TACKLES
/INSTRUMENTS FOR ELECTRICAL WORKS.**

- a) Insulation Tester
- b) Motorised megger - 0 - 1000 - 2000 - 5000V, 0 - 25000 M ohms
- c) Hand operated megger - 0.5 KV/1.0 KV/2.5 KV, 200 - 100 M ohm
- d) Earth resistance tester 0 to 1, 10, 100 ohms
- e) Transformer oil test kit
- f) Torque wrench
- g) Voltmeter ac 0 - 125 - 250 - 625 V AC
- h) Ammeter AC 0 - 2A - 10A AC
- i) Wattmeter - ac/dc - 0 - 125 - 250 V 0-5-10A.
- j) 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
- k) High vacuum stream line oil filter of 6000 LPH for mineral oil
and 1000- 600 LPH for silicone oil for transformer dryout.
- l) Variac - 1 phase - 5A, 15A 3 phase - 10A, 20A.
- m) Primary injection kit - 0-5000 A.
- n) Secondary injection kit - 0-5A.
- o) HV Test kit - 50 KV AC 400kVA.
- p) Wheatstone bridge - 0.05 m ohm - 100 ohm.
 - a. Oscilloscope
 - b. Oil Tank for Transformer

- q) Air Compressor
- r) Vacuum pump.
- s) Phase sequence meter - 110V - 450V - 25 to 65 Hz.
- t) Frequency meter - 0 - 115 - 230 - 4500 - 45 - 601/s.
- u) Tong Tester - 0 - 5A - 10A, 30A, 60A, 150A - 600A.
- v) Techometer
- w) mA Source
- x) Standard temperature gauges
- y) Temperature oil bath
- z) Micro Ohm Meter for contact resistance measurement of circuit breakers.
- aa) Event recorder for measurement of closing and opening time (with micro second accuracy)
- bb) DC Power Supply , 24 V ; 5A
- cc) Single Phase Variac 250V; 10A
- dd) Three Phase Variac 415V
- ee) Function Generator
- ff) Soldering irons, soldering pump, Vacuum cleaner, Air blower etc.
- gg) Tan Delta Test kit
- hh) Oil specific gravity and PPM measuring equipment
- ii) Dew point measurement instrument

7.2.6 RECOMMENDED LIST OF TOOLS & PLANTS TO BE ARRANGED BY CONTRACTOR FOR ELECTRICAL WORKS

SNO	DESCRIPTION
1	Steel wire ropes
2	Chain pulley block/turfer
3	2 " size pipe bending machine
4	Grinding machine
5	Drilling machines : 1/4" , 1/2" , 3/4" , 1 "
6	Copper tube bender and cutter sizes 6 mm ;8 mm ;1/2",1/4"
7	Dye sets for threading upto 2 " pipe
8	Set of spanners
9	Allenkey sets
10	Bench vice
11	Spirit level
12	Tap sets for both BSP & NPT threads upto 1 "
13	Measuring instruments like micrometers, calipers etc
14	Welding generator
15	Welding transformer
16	TIG Welding set
17	Mechanical tool kit for fitters
18	Electrician tool kit
19	Crimping tool

20	Flood light fittings
21	Fire extinguishers
22	Distribution boards with power cable complete as required
23	Hydraulic test pump rating 750 Kg/SQ.cm
24	Painting brush
25	Fire proof tarpaulin
26	Safety belts & safety helmets
27	Telephone sets

**SECTION VII
APPENDIX - I**

DATA SHEET

SPECIFIC TECHNICAL REQUIREMENTS

SUPPLY ITEMS

1.	Clamps	
	a. Material & Type	: Nylon self locking ties aluminium strips clamps as per Section VI
	b. Sizes	: To meet the requirements of Section VI
2.	Ferrules	: As per Section VI
3.	Tag	
	a. Material	: Aluminum/Fibre/Stainless Steel
	b. Markings	: Engraving/Embossing/Printing
	c. Size	: As required.
4.	Cable lugs	: Copper/Aluminium (crimping type)
5.	Clamp Spacing:	
	a. 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 150mm 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 35 mm 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)
	<p>Note:</p> <p>a. Supports shall also be provided at each bend.</p> <p>b. For any change in above spacing, prior approval of Engineer will be taken</p>	

SECTION VIII

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:1366** 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 VIII

APPENDIX –II

TENDER SPECIFICATION NO BHEL:PSSR:SCT:1366

**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 Govt. of India Undertaking)
Power Sector – Southern Region
EVR Periyar Building
690 , Anna Salai, Nandanam, Chennai – 600 035.

SECTION VIII
APPENDIX - III
CHECK LIST

TENDER SPECTFICATION NO: BHEL: PSSR : SCT : 1366

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 status : 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 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 : YES / NO
13. Whether PF exemption No. is allotted by RPFCL of your area if so, indicate number : YES/NO

SIGNATURE OF THE TENDERER