VOLUME – IA
Part I & II
TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED

CONTENTS

VOLUME-IA PART-I CHAPTER-I
PROJECT INFORMATION

Sl. No.	Title	Description
1	Owner/Customer	National Thermal Power Corporation Ltd.
2	Project Title	1 x 800 MW Darlipali STPP Stage-II.
4	Project Site Location	Darlipali Super Thermal Power Station is located in Sundargarh District of Odisha. Sundargarh is connected to all major towns in Odisha by road. It is connected to Rourkela and Sambalpur by State Highway SH-10. The Project is located north of Raigarh - Jharsuguda National Highway, NH-200 and is approachable from Gandhi Chowk (near Brajrajnagar) through 15 Km long road. Nearest major town is Jharsuguda, located at a distance of 25 Km from the project.
5	Latitude & Longitude of project site	Latitude 21º55'00" (N)
		Longitude 83º53'35" (E)
6	Nearest Railway Station	Brajarajnagar at 20 Km on SEC Railway
7	Nearest Town	Jharsuguda (approx. 25 km)
8	Nearest Airport	The nearest commercial airport, Veer Surendra Sai Airport Jharsuguda, is about 40 Km from the project site
9	State Capital	Bhubaneswar (350 km)

VOLUME IA PART I CHAPTER II
SCOPE OF WORKS

1.2.1 THE SCOPE OF THE WORK WILL COMPRISE OF BUT NOT LIMITED TO THE FOLLOWING:

The scope of works at 1X800MW Darlipalli Stage-II Thermal Power Project consists of the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified).

1.2.1.1 CONSTRUCTION POWER DISTRIBUTION SYSTEM

The proposed construction power supply network shall broadly consist of the following:

1.2.1.1.1 BHEL 11KV Incoming Power Receiving Station consisting of 11/11.5 KV isolation transformers, 11KV RMUs and and allied works.

1.2.1.1.2 11KV cabling from customer Sub-Station to BHEL equipment at Incoming Power Receiving Station. Further this cable is to be routed through existing cable trays/racks in Stage-I over an approx. distance of 2 kms to reach Stage-II project area

1.2.1.1.3 11KV ring mail system around the Plant area, using overhead lines and underground cables.

1.2.1.1.4 Approx. 11 Nos Skid mounted substations of rating 500 KVA, 11/0.433 kV each. All the Substations shall be connected to 11 KV ring main feeder/other nearby 11KV Switchgear.

1.2.1.2 AREA LIGHTING AND YARD LIGHTING

1.2.1.2.1 Area Lighting and Yard Lighting shall be done using steel tubular swaged poles, 9-meter-long with LED light fitting, 30Meter High Mast Lights.

1.2.1.3 OPERATION AND MAINTENANCE

1.2.1.3.1 Operation and Maintenance of the aforesaid Construction Power Distribution System, Area Lighting and Yard Lighting

1.2.2 The entire scope of works is broadly divided into two Packages as given below:

1.2.2.1 Package A:

Erection and Commissioning of Construction Power Supply, Area Lighting and Yard Lighting including supply of materials at 1X800MW Darlipalli Stage-II Thermal Power Project as specified in the tender specifications.

1.2.2.2 Package B

Operation and Maintenance of the Construction Power Supply, Area Lighting and Yard Lighting established under Package A.

1.2.3 The broad scope of work covered in Package A is as follows:

The scope of work covers design, preparation of Drawings, Documents approval from Statutory authority. Supply of Materials, installation as per approved drawings, erection, testing, commissioning, obtaining statutory clearance for charging of the entire system covered under

this scope in a phased manner as per site requirement (any number of times till completion of entire scope under this contract.) and maintenance of the same.

Erection, testing and commissioning of Construction Power supply system as per design and approved drawings. Liaison with electrical inspector for field inspection for the erected system. rectification and any modification work as suggested by electrical inspectorate and obtaining changing clearance for the entire system in a phased manner as per site requirement, any number of times till obtaining charging clearance for entire scope covered under this contract.

1.2.3.1 Route survey, design, preparation of route drawing, Detailed SLD for Overhead Distribution Underground Distribution Network/ and any other calculation, BHEL incoming Power Receiving Station drawing, 11kV/433V substation drawing, 11kV ring main system distribution drawing, Two/Four/Six/Eight pole structure arrangement drawing (if applicable), Earthing details, Earthing layout, Sag Calculation, etc. & any other document /drawing as required by Electrical Inspectorate and getting approval of above from statutory authority and also includes liaison with electrical inspectorate for field inspection and obtaining clearance certificate for charging the entire system in a phased manner as per site requirement (any number of times till completion of entire scope under this contract.)

1.2.3.2 BHEL Supply Materials are 11/11.5KV Isolation transformer, 11KV RMUs, 500KVA 11KV/433V Skid mounted Sub Stations, High Mast Lights and HT cables of sizes 3CX185 sqmm, 3CX95 sqmm and LT Cables of sizes 3.5CX25 sqmm, 3.5Cx35 sqmm, 3.5CX70 sqmm, 3.5Cx95 sqmm and 3.5CX185 sqmm,etc. as specified in the BOQ.

1.2.3.3 For BHEL supply materials, identification of items at stores / yards, checking, reporting the damages if any, taking delivery at storage yard / stores, loading, transportation, unloading at Contractor's stores / working yard, keeping in safe custody in contractor's stores is to be ensured by the contractor

1.2.3.4 Contractor shall arrange safe custody for BHEL issued materials till completion of erection and charging of the system. Contractor is responsible for any missed/ theft items of BHEL materials and same shall be arranged by contractor at their cost. If the same will be arranged by BHEL, the total cost will be recovered from the contractor's running bills along with applicable overheads.

1.2.3.5 All other Materials which are required for completion of the entire scope of works is in contractor's scope, except those materials which shall be supplied by BHEL.

1.2.3.6 Supply all materials as mentioned in BOQ and safe storing of supplied materials till completion of erection and charging of the system. If any supplied materials are missed in the contractor's custody till handing over / Charging of the system, the same shall be replaced by the contractor at free of cost. Replacement of any missing item / theft items is under scope of contractor.

1.2.3.7 Pre-assembly, calibration, checking, erection, testing and commissioning & post-commissioning activities along with the supply of all consumables, tools and tackles, testing instruments, supply of consumables like electrodes, gas, cable dressing materials, HT / LT insulation tapes, tag plates, PVC sleeves for wire marking, lugs, fasteners, paints and its

consumables. Deployment of skilled / unskilled manpower, engineers / supervisors, Tools & Plants (T & P), Material handling equipments, testing instruments, returning of un-used materials / items to BHEL stores. The installation and commissioning of all the electrical equipment / items shall conform to the technical requirements specified elsewhere in the tender.

1.2.3.8 Erection, testing, commissioning and maintenance of all the equipment like transformer, RMUs, etc. at BHEL incoming Power Receiving Station.

1.2.3.9 Supply, Erection and Commissioning of 50 KVA/100KVA 11KV/ 433V oil filled distribution transformer.

1.2.3.10 Supply, Erection and Commissioning of UPS System as specified in the BOQ.

1.2.3.11 Design, Supply and Erection of Control Panel /Control desk for operation of the 11KV incoming station.

1.2.3.12 Supply of required materials, Erection, testing, commissioning of 11 KV/ 433 V 500 KVA Skid mounted sub – stations.

(Note : 11KV/ 433V, 500 KVA Skid mounted substation shall be supplied by BHEL).

1.2.3.13 Supply and installation, laying, termination of 11 KV O/H line and related items like Poles, pin insulators, disc insulators, etc. as specified in BOQ.

1.2.3.14 Laying of Underground HT/LT cable for power distribution and maintenance of 11 KV power distribution systems including allied civil works.

[Note: BHEL will supply only those HT/LT Power cables which are in BHEL's scope as specified above. Bidder to refer the BOQ for all other cables in contractor's scope.]

1.2.3.15 Supply, erection and commissioning of 11 KV pillar box.

1.2.3.16 Supply, erection of Earthing materials, Structural steel materials as required.

1.2.3.17 Supply and installation of steel tubular swaged poles, 9 meter long with LED light fitting and other accessories.

1.2.3.18 Supply, Erection and Commissioning of Power Distribution Boards, Lighting Distribution Boards, etc.

1.2.3.19 Supply of required materials for area lighting, materials like LDBs, flexible copper wire, earthing materials etc.

1.2.3.20 The contractor shall have valid HT ELECTRICAL CONTRACTOR LICENSE, required to carry out the scope of works, as on date of commencement of work.

1.2.3.21 Civil works in BHEL Incoming Power Receiving Station, Civil Works of Skid mounted substation and Civil Works of 11KV Pillar Box is covered under the scope of this contract.

1.2.3.22 Area Lighting and Yard Lighting shall be done using steel tubular swaged poles, 9-meter long with LED light fitting and High Mast lights.

(Note: Civil Foundation of High Mast Lights is excluded from the scope of this contract.)

1.2.3.23 **Note:** The above stated works is indicative only for the bidder's guideline. Any other works not mentioned above, but required for completion of the package in total, deemed to have been included in the bidder scope under this contract. Such work will be executed under this contract by bidder as per the direction of Engineer in charge. If any item of work not available in the rate schedule of this contract, the rate will be fixed in line with clause 2.15.7 of GCC.

1.2.4 The broad scope of work covered in Package B is as follows:

1.2.4.1 Deployment of Manpower viz. Electricians, Helpers and Supervisor as required 24X7 on shift basis, as decided by BHEL Site, for a period of approx. 39 months, with required T&P for the works of operation and maintenance of construction power distribution system, yard lighting and area lighting, which consists of all the components and equipment erected and commissioned under package A. The man power should be available throughout the year inclusive of all holidays and Sundays. Manpower strength shall be decided by site according to site requirement.

1.2.4.2 At least One manpower engaged by the contractor must possess a valid Electrical license (HT) for O&M of BHEL 11KV Incoming Power Receiving Station and handling other Electrical equipment in the scope of this contract.

1.2.4.3 The scope of O & M work includes identification of items at stores / yards, checking, reporting the damages if any, taking delivery at storage yard / stores, loading, transportation to working yard, pre-assembly, calibration, checking, replacing, testing and commissioning, & post-commissioning activities using their tools and tackles and testing instruments along with the supply of all consumables like insulation tapes , HT tapes ,electrodes, gas, paints, cable dressing materials, tag plates, PVC sleeves, HT/LT joint kits etc.

1.2.4.4 Spares like HRC fuses, bulbs are excluded from the contractor's scope and will be provided by BHEL.

1.2.4.5 All necessary Hand tools set including double end spanner set, ring spanner set, Box spanner set, Allen Key set, Star screw driver set etc., Digital multimeter. 5KV Digital Megger, earth tester, Digital clip on tong tester, Phase sequence Meter,11KV earthing rods, Hand Drilling Machines, manila ropes, Normal aluminium Ladders etc., shall be in the contractor's scope. Minimum 04 sets of above shall be arranged by contractor for Maintenance at their quoted rates.

1.2.4.6 Any other special tools & tackles are required to maintain the System shall be arranged by the contractor.

1.2.4.7 Special type ladders for street light maintenance shall be arranged by contractor whenever necessary at their quoted rates.

1.2.4.8 All consumable items like HT taps, PVC/ Cotton insulation tape, required fasteners for replacement of damaged/ rusted ones, gases, welding electrodes has to be arranged by contractor at their quoted rates.

1.2.4.9 The Cable jointing work of all cables (HT, LT Control cables) are under the scope of contractor during maintenance period. The contractor shall arrange suitable cable jointer immediately to

rectify the cable damage. Rs 3000/- per LT cable joint and Rs 6000/- per HT cable Joint shall be paid extra for jointing work and required Cable Jointing Kits shall be issued by BHEL at free of cost.

1.2.4.10 Fire extinguishers will be maintained by the contractor till end of O & M period. However, refilling and re testing of the same after guarantee period will be borne by BHEL.

1.2.5 Any O & M work during the maintenance shall be carried out by the contractor by arranging necessary machine tools like Hydra crane, oil filtration machine, DG set etc., at their quoted rates.

1.2.6 Contractor shall attend the break down and replace the defective components promptly, failing which BHEL will get the same done and recover the amount from the contractor with applicable overheads.

1.2.7 During the maintenance period, if the contractor fails to deploy adequate manpower continuously for one week, BHEL reserves the right to engage necessary manpower and recover the amount from the contractor with applicable overheads.

1.2.8 Periodic maintenance of all erected equipment as prescribed by BHEL is in the Bidder's scope.

1.2.9 During execution of the work, contractor shall at all times conform to BHEL, Customer (NTPC) safety and gate pass requirements prevalent at site.

FOR FURTHER DETAILED SCOPE OF WORKS REFER RELEVANT CHAPTERS IN THIS BOOK – TECHNICAL SPECIFICATION.

VOLUME IA PART I CHAPTER III
FACILITIES & CONSUMABLES IN THE SCOPE OF CONTRACTOR / BHEL
(SCOPE MATRIX)

1.3 PART I (SCOPE MATRIX) – SITE FACILITIES

SL.NO	DESCRIPTION - PART I	SCOPE TO BE TAKEN CARE BY		REMARKS
		BHEL	BIDDER	
1.3.1.1	**ESTABLISHMENT**			
1.3.1.1.1	**FOR CONSTRUCTION PURPOSE**			
A	Open space for office	Yes		Free of cost as provided by customer on as is where is basis
B	Open space for storage	Yes		
C	Construction of bidder's office, canteen and storage building, including supply of materials and other services		Yes	At bidder's own cost
D	Bidder's all office equipments, office/ store/ canteen consumables		Yes	At bidder's own cost
E	Canteen facilities for the bidder's staff, supervisors and engineers etc.		Yes	At bidder's own cost
F	Firefighting equipments like buckets, extinguishers etc. to assist bidder in his execution of works		Yes	At bidder's own cost
G	Development of land provided for office, storage, fabrication yard, etc.		Yes	At bidder's own cost
H	Fencing of storage area, office, canteen, etc. of the bidder		Yes	At bidder's own cost
1.3.1.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
A	Open space		Yes	To be arranged by Bidder at his own cost
B	Living accommodation		Yes	At bidder's own cost

SL.NO	DESCRIPTION - PART I	SCOPE TO BE TAKEN CARE BY		REMARKS
		BHEL	BIDDER	
1.3.1.2	**ELECTRICITY**			
1.3.1.2.1	**Electricity for construction purposes**			
1.3.1.2.1.1	Single point source	Yes	Yes	Refer clause 1.3.4 below: (if provided by BHEL it will be on chargeable basis)
1.3.1.2.1.2	Further distribution for the work to be done which include supply of materials and execution		Yes	At bidder's own cost
1.3.1.2.1.3	Distribution of Electricity for the office, stores, canteen, of the bidder which include supply of materials and execution		Yes	At bidder's own cost
1.3.1.2.1.4	Supply, installation and connection of material of energy meter including operation and maintenance		Yes	At bidder's own cost
1.3.1.2.1.5	Duties and deposits including statutory clearances for the above		Yes	At bidder's own cost
1.3.1.2.1.6	Demobilization of the facilities after completion of works		Yes	At bidder's own cost
1.3.1.2.1.7	Electricity for living accommodation of the bidder's staff, engineers, supervisors, labour hutments, etc.		Yes	At bidder's own cost
1.3.1.3	**WATER SUPPLY**			
1.3.1.3.1	For construction purposes			
1.3.1.3.1.1	Making the water available at single point		Yes	At bidder's own cost
1.3.1.3.1.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	At bidder's own cost
1.3.1.3.2	Water supply for bidder's office, stores, canteen, etc.			
1.3.1.3.2.1	Making the water available at single point		Yes	At bidder's own cost

SL.NO	DESCRIPTION - PART I	SCOPE TO BE TAKEN CARE BY		REMARKS
		BHEL	BIDDER	
1.3.1.3.2.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	At bidder's own cost
1.3.1.3.3	Water for living accommodation of the bidder's staff, engineers, supervisors etc.		Yes	At bidder's own cost
1.3.1.4	**LIGHTING**			
1.3.1.4.1	For construction work (supply of all the necessary materials) At office storage area At the preassembly area At the construction site / area		Yes	At bidder's own cost
1.3.1.4.2	For construction work (Execution of the lighting work / arrangements) At office storage area At the preassembly area At the construction site /area At the labour hutment		Yes	At bidder's own cost
1.3.1.4.3	Providing the necessary consumables like bulbs, switches, etc. during the course of project work		Yes	At bidder's own cost
1.3.1.4.4	Lighting for the living purposes of the bidder at the colony / quarters		Yes	At bidder's own cost
1.3.1.5	**COMMUNICATION FACILITIES for site operations of the bidder**			
1.3.1.5.1	Telephone, Fax, internet, intranet, email etc.		Yes	At bidder's own cost

1.3.2 PART II (SCOPE MATRIX) - EXECUTION

SL.NO	DESCRIPTION PART II	SCOPE TO BE TAKEN CARE BY		REMARKS
		BHEL	BIDDER	
1.3.2.1	**EXECUTION**			
1.3.2.1.1	Providing the erection drawings covered under this scope	Yes	Yes	
1.3.2.1.2	Drawings for construction methods		Yes	In consultation with BHEL
1.3.2.1.3	As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site		Yes	In consultation with BHEL
1.3.2.1.4	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL, As per requirement of BHEL targets
1.3.2.1.5	Review of performance (Form-14) and revision of site schedules in order to achieve the end dates and other commitments	Yes	Yes	
1.3.2.1.6	Weekly schedules based on Sl No 1.3.2.1.1		Yes	
1.3.2.1.7	Daily work plan based on Sl No 1.3.2.1.3		Yes	For daily monitoring meeting at site
1.3.2.1.8	Periodic visit of the senior official of the bidder to site to review the progress so that work is completed as per schedule. It is suggested this review by the senior official of the bidder should be done at least once in every two months.		Yes	

1.3.3 OPEN SPACE:

Open space, as provided by NTPC, will be provided to the bidder free of cost. The contractor has to plan and use the land his temporary office, shed and the storage of plant & machineries and materials. Security of stores & work place shall be in Contractor's scope. Land will be allocated with certain time frame and to the extent available/ considered necessary, and will be reviewed

by BHEL depending upon the area availability. The contractor will be responsible for handing back all lands, as handed over to him by BHEL.

BHEL shall not provide to the contractor any residential accommodation to any of his staff and the contractor has to make his own arrangements at his cost. Bidder has to identify their own land for labour colony if any required and no land will be given by BHEL for labour colony purpose.

1.3.4 ELECTRICITY:

1.3.4.1 Initially, Contractor has to make his own arrangement for Construction Power at his own cost to have uninterrupted work. Any duty, deposit involved in getting the Electricity shall be borne by the bidder. As regards to contractor's office shed also, all such expenditure shall be borne by the contractor. Contractor may make his own arrangement for power supply through deployment of adequate number of DG sets if required, at their cost.

1.3.4.2 All temporary wiring must comply with local regulations and relevant Indian Electricity Act/Rules and will be subject to the BHEL/NTPC's inspection and approval before connection to supply and later. The contractor shall be responsible to provide complete distribution observing the safety rules laid down by electrical authority of the State / BHEL / their customer with appropriate statutory requirements.

1.3.4.3 However, on energization of first 11KV/433V Substation in the Construction Power network, the contractor may take power from the same. Such Construction Power consumed by the contactor shall be chargeable for the actual energy consumed by the contractor (Energy Charges Only) based on prevalent rates of DISCOM.

1.3.4.4 The existing rates are indicated below:

Energy Charge:
For Load Factor =<60% : 585.00 Paise/kVAh
For Load Factor >60% : 475.00 Paise/kVAh

1.3.4.5 The above rates are indicative only. This rate may vary from time to time and the prevailing rates during execution shall be applicable.

1.3.4.6 However, contractor shall make his own arrangements in case of non-availability of power supply.

1.3.4.7 Necessary "Capacitor Banks" to improve the Power factor to a minimum of 0.9 shall be provided by the contractor at his cost. On account of the contractor's failure in maintaining the power factor as required by customer, penalty if any, levied by customer will be recovered from contractor's bills.

1.3.4.8 The contractor shall make his own arrangement for further distribution of power, taking due care of surrounding construction activities like movement of cranes & vehicles, civil work, fabrication/construction/assembly/ erection etc. and safety of personnel. Sometimes it may become necessary to relocate some of the installations to facilitate work by other agencies or by him.

1.3.4.9 The contractor shall be responsible to provide complete distribution of supply observing the safety rules laid down by electrical authority of the State / BHEL / their customer with appropriate statutory requirements.

1.3.4.10 All cables being used for construction power shall be armoured only. Buried cable shall be suitably identified by the route markers.

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

1.3.4.12 As there are bound to be interruptions in regular power supply, power cut / load shedding in construction sites, contractor is not entitled for any compensation. Contractor shall make his own arrangement for alternative source of power supply through deployment of adequate number of DG sets with consumables at their cost during the power breakdown / failure / construction area is far away from supply source to get urgent and important

1.3.4.13 Contractor has to make his own arrangements for electricity requirement for his labour colony, at his own cost.

1.3.5 WATER:

1.3.5.1 Contractor shall make his own arrangements for the required Construction water and arrange for further distribution at their cost.

1.3.5.2 Water for drinking purpose to be arranged by the bidder at his cost.

1.3.5.3 Water for labour colony to be arranged by the bidder at his cost.

1.3.6 CONSUMABLE

1.3.6.1 All consumables required for the scope of work, shall be arranged by the contractor at his cost unless otherwise specifically mentioned in the contract.

1.3.6.2 Indicative list of consumables to be arranged by the Contractor is given below:

1.3.6.2.1 All types of welding electrodes, filler wires, Gases

1.3.6.2.2 Provision for Temporary Scaffoldings.

1.3.6.2.3 Insulation tape (HT/LT).

1.3.6.2.4 Paints required for primer & final coating and for protective coating.

1.3.6.2.5 Solder wire (Lead) -(60/40)

1.3.6.2.6 Protocol / Calibration report sheets as per BHEL Format.

1.3.6.2.7 Panel/ JB sealing compound material (for cable entry from bottom / top of Panel).

1.3.6.2.8 Materials required for cable dressing (GI / aluminum flats, PVC cable ties etc.).

1.3.6.2.9 PVC wire marker sleeves and Tag plates

1.3.6.2.10 Lugs of all size.

1.3.6.2.11 Anchor fasteners for fixing of frames, GI pipes & LDBs / JBs.

1.3.6.2.12 Required Nickel/ GI fasteners for 33KV and 11KV over system Work

1.3.6.3 In the event of failure of contractor to bring necessary and sufficient consumables, BHEL may arrange for the same. However, the entire cost towards this along-with overhead shall be paid by the contractor or deducted from the contractor's bills.

1.3.6.4 The above list is not exhaustive. The contractor has to arrange all the consumables for the scope of works unless otherwise specifically mentioned in the contract.

1.3.7 LIGHTING FACILITY:

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

1.3.8 CONTRACTOR'S OBLIGATION ON COMPLETION:

1.3.8.1 On completion of work, all the temporary buildings, structures, pipe lines, cables etc. shall be dismantled and leveled and debris shall be removed as per instructions of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final

1.3.9 DEWATERING

1.3.9.1 Contractor shall ensure at all times that his work area & approach/ access roads are free from accumulation of water, so that the materials are safe and the progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL. No separate payments for dewatering, if required, at any time during execution of the work including monsoon period shall be considered by BHEL.

1.3.10 HT ELECTRICAL LICENSE

1.3.10.1 The contractor shall have valid HT ELECTRICAL CONTRACTOR LICENSE, as required to carry out the scope of works, as on date of commencement of work. Copy of the certificate shall be furnished to BHEL site engineer.

1.3.11 BID DRAWINGS

1.3.11.1 Tentative Plot plan drawing is enclosed for information and this may get revised during execution.

VOLUME IA PART I CHAPTER IV
T&PS AND MMEs TO BE DEPLOYED BY CONTRACTOR

1.4.1 All the tools & plants required for this scope of work are to be arranged by the contractor within the quoted rates. Necessary accessories for the tools & plants shall also be provided by the contractor

1.4.2 The following minimum major (T&P) shall be deployed by the contractor for execution of this contract with in the quoted rate:

1.4.2.1 For loading and transportation, all necessary T&P such as Trailers, Cranes, Winches, welding generators, slings, jacks, sleepers, rails etc., as required are to be arranged by the contractor.

1.4.2.2 The contractor at his cost shall arrange all cranes and truck / tractor, trailers required for material handling purpose and also cranes, back hoe loaders like JCB, etc. as required for erection.

1.4.2.3 Oil filtering machine with BDV kit – As required

1.4.3 EQUIPMENT FOR TESTING & COMMISSIONING:

1.4.3.1 The following testing equipment / T&P shall be made available at site by contractor in sufficient number as required to carry out the job simultaneously in more than one area.

a. 5KV Digital insulation tester (Megger)
b. Digital Multimeter
c. Digital Clip on Tong tester
d. Phase sequence meter
e. Earth resistance tester
f. Digital frequency meter
g. Torque wrench
h. Air Blower
i. Vacuum cleaner
j. Transformer oil BDV test Kit
k. Micro ohm meter if reqired
l. Oil filtration machine if required
m. Contact resistance measurement kit if required

1.4.4 Notes for this chapter:

1.4.4.1 Above list of T & Ps and testing equipment are for indicative purpose only. Any other T & Ps and testing equipment required for successful completion of the scope of the contract shall also be arranged by the contractor within the quoted rate.

1.4.4.2 The above instruments / equipment will be sent for testing and calibration from time to time and maintained by contractor as required by BHEL.

1.4.4.3 All testing instruments shall have calibration certificate issued by recognized / accredited agencies.

1.4.4.4 List of such agencies and periodicity of calibration required for different instruments will be furnished by BHEL at site.

1.4.4.5 Contractor shall maintain calibration records as per the BHEL format and produce them whenever called for by BHEL Engineers.

1.4.4.6 Contractors shall arrange experienced/qualified persons for using these calibration instruments at laboratory and also at work spot.

1.4.4.7 Wherever frequent calibration is required, contractor shall arrange adequate number of instruments such that the work does not suffer for want of test instruments.

1.4.5 PROTECTION / HANDLING OF TOOLS AND PLANT ARRANGED BY THE CONTRACTOR

1.4.5.1 Equipment, vehicles, tools and plants and materials brought to site by the contractor from his resources shall have distinctive identification marks and the contractor shall intimate the description and quantity to BHEL in writing.

1.4.5.2 All construction materials brought by the contractor shall have prior approval regarding quality and quantity by BHEL. The contractor shall also provide without extra cost necessary enclosures containers and protective materials for proper storage of materials inside, whenever so instructed by the purchaser without any extra cost.

1.4.5.3 No material or equipment or tools etc. shall be taken out of the work-site without the written consent of BHEL.

1.4.5.4 BHEL shall not be responsible for the safety and protection of the materials of the contractor and the contractor shall make his arrangements for proper watch and ward for his materials.

VOLUME IA PART I CHAPTER V
T&Ps AND MMEs TO BE DEPLOYED BY BHEL ON SHARING BASIS

1.5.1 No Tools & Plants (T & Ps), MMEs shall be provided by BHEL

VOLUME IA PART I CHAPTER-VI
TIME SCHEDULE

1.6.1 Package- A:

1.6.1.1 CONTRACT PERIOD FOR PACKAGE A:

The entire work under Package A i.e. Erection and Commissioning of Construction Power Supply, Area Lighting and Yard Lighting including supply of materials at 3X800MW Talabira Thermal Power Project as specified in the tender specifications shall be completed within **seven (7) months** from the date of commencement of work at site.

1.6.1.2 COMMENCEMENT OF CONTRACT PERIOD FOR PACKAGE A:

The date of commencement of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy the decision of BHEL engineer is final.

1.6.1.3 TIME SCHEDULE FOR PACKAGE A

1.6.1.3.1

Sl. No.	Milestone Activity	Completion in days from commencement of contract period of Package A
1.	Finalization of Construction Power Distribution network and drawing approval	45
2.	Commencement of Erection	45
3.	Completion of Construction of 4 nos. Package Substations (1-4) including laying of corresponding power feeder network	105
4.	Completion of Construction of next 4 (5-8) substations including laying of corresponding power feeder network	150
5.	Completion of Construction of remaining substations including laying of power feeder network	195
6.	Completion of all remaining works under Package A	210

1.6.1.3.2 Intermediate Milestones

Sl. No.	Milestone Activity	Completion in days from commencement of contract period of Package A
1.	Completion of Construction of 4 nos. Package Substations (1-4) including laying of corresponding power feeder network	105
4	Completion of Construction of remaining substations including laying of power feeder network	195

1.6.1.3.3 In order to meet above schedule in general, and any other intermediate targets set, to meet customer / project schedule requirements, contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL Engineer.

1.6.1.3.4 In case the project is to be advanced, the erection works in the scope of the contractor is to be advanced to meet the project requirement. No extra payment whatsoever shall be paid on this account.

1.6.1.4 PENALTY FOR INTERMEDIATE MILESTONES

a. M1 and M2 shall be intermediate Milestones for the work..

b. In case of slippage of these identified Intermediate Milestones, Delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones with reference to Form 14.

c. Incase delay in achieving M1 milestone is solely attributable to the contractor, 0.5% per week of executable contract value* limited to Maximum 2% executable contract value will be withheld.

d. Incase delay in achieving M2 milestone is solely attributable to the contractor, 0.5% per week of executable contract value* limited to maximum 3% of executable contract value will be withheld.

e. Amount already withheld, if any, against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 milestone.

f. Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone

payment and balance amount (if any) shall be withheld @ 10% of RA Bill amount from subsequent RA bills.

g. Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion / closure of contract. Withheld amount, if any due to slippage of intermediate milestones shall be adjusted against LD or released as the case may be.

h. In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted in to recovery.

Note: * Executable contract value-value of work for which inputs/fronts were made available to contractor and were scheduled for execution till the date of achievement of that milestone.

1.6.1.5 GUARANTEE PERIOD FOR PACKAGE A

1.6.1.5.1 GUARANTEE PERIOD FOR CONTRACTOR SUPPLIED ITEMS UNDER PACKAGE A

The guarantee period of twelve months shall commence from the date of commissioning of that specified item as certified by BHEL Engineer.

1.6.1.5.2 GUARANTEE PERIOD FOR WORKMANSHIP FOR WORKS EXECUTED UNDER PACKAGE A

The guarantee period of twelve months for Package A shall commence from the date of acceptance of the commissioning / charging of last substation of this contract.

1.6.2 Package- B:

1.6.2.1 CONTRACT PERIOD FOR PACKAGE B:

The operation and maintenance period of the construction power distribution system, Area Lighting and Yard Lighting established under Package A shall be **39 months** from the date of commencement of contract period for operation and maintenance.

1.6.2.2 COMMENCEMENT OF CONTRACT PERIOD FOR Package B: Operation & Maintenance

The date of commencement of contract period shall be the date of acceptance of the commissioning of the first 11KV/ 433V Substation in the Construction Power Supply network by BHEL Engineer after commissioning of the BHEL Incoming Power Supply at BHEL Incoming Yard.

Till that time the contractor has to operate & maintain already energized sub-stations at free of cost. In case of discrepancy the decision of BHEL engineer is final.

1.6.2.3 GUARANTEE PERIOD FOR PACKAGE B

Not Applicable.

VOLUME-IA PART – I CHAPTER-VII
TERMS OF PAYMENT

1.7.1 Package A

1.7.1.1 The progressive payment against monthly running bills for erection, testing and commissioning as per the percentage mentioned below on accepted rate / price of contract value will be released as mentioned below in Clause 1.7.1.2 on Pro rata basis.

1.7.1.2

Sl. No.	Activity / Work Description	% of unit rate
1.7.1.2.1	**Preparation of drawings and obtaining statutory clearances etc.**	
i.	On completion of preparation of drawings and obtaining approval from statutory authority.	50%
ii.	On obtaining charging clearance from statutory authority and successful charging on prorate basis	50%
1.7.1.2.2	**Supply of Materials**	
i.	On receipt of material, verification of documents and on acceptance at site on pro-rata basis	75%
ii.	On charging on pro-rata basis	25%
1.7.1.2.3	**Laying of HT / LT cable**	
i.	On laying of cable	45%
ii.	Termination of cables with respective equipment	25%
iii.	Checking, fixing of cables, route marker and completion of HV test and charging	30%
1.7.1.2.4	**Stringing of 11 KV O/H line**	
i.	On completion of line stringing	45%
ii.	On completion of completion of end connection	25%
iii.	On completion of Charging	30%
1.7.1.2.5	**Erection and Commissioning of Skid Mounted SS , Transformers**	
i.	Receipt, positioning, alignment and earthing of equipment etc.	60%
ii.	Testing, Commissioning and charging of each substation	40%
1.7.1.2.6	**Erection and testing of Pillar box, Street lighting and area lighting**	
i.	On completion of erection	70%
ii.	On completion of charging	30%

Sl. No.	Activity / Work Description	% of unit rate
1.7.1.2.7	**Erection of PSCC/ Steel poles/ Two / four/ Six / eight pole structures**	
i.	On completion of erection including foundation	65%
ii.	On completion of line stringing	20%
iii.	On completion of Charging	15%
1.7.1.2.8	**Erection of any other item, not covered above, the terms of payment except Civil Works**	
i.	On Erection on pro rata basis	65%
ii.	On completion of work	35%
1.7.1.2.9	**For Civil Works**	
i.	Completion of works certification by Engineer in charge	95%
ii.	Submission of Quality documents	5%

1.7.1.3 Retention Amount as per GCC Clause 2.22 shall be applicable.

1.7.1.4 Quantity Variation as per GCC Clause 2.14 for Package A will be with reference the awarded price of Package A.

1.7.1.5 Following clauses of GCC is not applicable for Package A:

i. PVC as per GCC clause 2.17.
ii. ORC as per GCC clause 2.12.
iii. Secured Recoverable Advance as per GCC clause 2.13.

1.7.2 <u>Package B</u>

1.7.2.1 For Operation & Maintenance under Package B, payment for Monthly RA Bills shall be made as follows:

1.7.2.1.1 For the deployed manpower, monthly charges payable based on minimum wages and other statutory pay elements along with **5% service charges** on such payments shall be paid.

1.7.2.1.2 The category of labour is considered as follows:

i. Electrician-Skilled Worker
ii. Helper- Unskilled Worker
iii. Supervisor- Highly Skilled Worker

1.7.2.1.3 The prevalent minimum wages and other statutory pay elements at site is indicated elsewhere in the tender specifications. Bidder to note that these may undergo change from time to time and the minimum wages and other statutory

pay elements along with corresponding service charge as on the day of actual execution shall be paid to the contactor.

1.7.2.2 Following clauses of GCC is not applicable for Package B:

i. PVC as per GCC clause 2.17.
ii. ORC as per GCC clause 2.12.
iii. Secured Recoverable Advance as per GCC clause 2.13.
iv. Retention Amount as per GCC clause 2.22.
v. Extra Works as per GCC clause 2.15.
vi. Supplementary items as per GCC clause 2.16.
vii. Performance Guarantee for Workmanship as per GCC clause 2.24.
viii. Quantity variation as per GCC clause 2.14

1.7.3 Security Deposit

1.7.3.1 Security Deposit for Package A and Package B shall be submitted separately. The Security Deposits for both Package A and Package B are to be submitted before start of the work of Package A.

However, Security Deposit of each Package will be returned upon fulfillment of contractual obligation of the respective Package in line with GCC Clause 1.11.

1.7.4 Measurement of Work and Mode of Payment

1.7.4.1 Measurement of Work and Mode of Payment as per GCC clause 2.6 shall be dealt separately for Package A and Package B.

1.7.5 Rights of BHEL as per GCC clause 2.7

1.7.5.1 Rights of BHEL as per GCC clause 2.7 shall be dealt separately for Package A and Package B.

VOLUME-IA PART – I CHAPTER-VIII
TAXES AND DUTIES

1. **All taxes and duty other than GST & Cess and BOCW Cess**

   The contractor shall pay all (**except the specific exclusion viz GST & Cess and BOCW Cess, both of which are dealt separately**) taxes, fees, license charges, deposits, duties, tools, royalty/ seigniorage, commissions, Stamp Duties, or other charges / levies, which may be levied on the input goods (including construction material viz. sand, coarse aggregates, moorum, borrowed earth, etc.) & services consumed and output goods & services delivered in course of his operations in executing the contract **and the same shall not be reimbursed by BHEL**. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.

2. **Goods and service Tax (GST) -**

   For GST Registered bidder:

2.1. The successful bidder shall furnish proof of GST registration under GST Law, covering the supply and services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by the successful bidder on BHEL for this project/ work. The bidder to specify in their offer the category of registration under GST i.e. Regular dealer or composite dealer**.**

2.2. Bidder's price/rates shall be exclusive of GST & GST Compensation Cess (herein after termed as GST).

2.3. Vendor / Contractor require to ensure that all Input Tax benefits as per existing laws have been considered.

2.4. Price quoted by the composite dealer shall be considered as inclusive of GST. In the event of any change in the status of vendor / Contractor

from composite to regular dealer after the submission of the bid but before completion of supply of services or goods, Contract value shall be amended to remove the embedded GST and any ITC benefit arising due to change of status, which shall be passed on to BHEL. GST paid on the amended contract value shall be reimbursed at actuals against the Tax invoice if BHEL is able to take input tax credit. However, no reimbursement of GST shall be made if BHEL is not able to take input tax credit. The decision of BHEL in this regard will be final and binding on the vendor/contractor.

2.5. It is the responsibility of the vendor / contractor to adhere to all the provisions of E- Invoicing under GST Act (if applicable). As per the E-Invoicing provisions vendor / Contractor has to generate IRN and QR Code from the E-Invoicing system and the same need to be printed in the invoice submitted to their customer. Invoices that do not comply to the above requirements, will not be accepted by BHEL. If the successful Bidder is not falling under the preview of E-Invoicing, then he has to submit a declaration in that respect along with relevant financial statements. However, applicability of E-invoicing, shall be verified from the E-Invoicing portal on submission of vendor / Contractor GSTN. BHEL shall reimburse GST only if all the provisions of E-invoicing are complied with.

2.6. It is the responsibility of the vendor/ Contractor to issue the Tax Invoice strictly as per the format prescribed under the GST Act within the prescribed time period in order to enable BHEL to avail input tax credit within the due date. Invoices shall be submitted on time to the concerned BHEL Engineer In Charge. Tax invoice should also contain below details

a. Contractor Name and Contact details.
b. GST No of Contractor
c. PAN No of Contractor
d. Document Type: Tax Invoice/ Debit Note/ Credit Note
e. Category: B2B / B2C (B2B is only applicable w.r.t BHEL)
f. Customer Name and Contact details / Bill To Details (as mentioned below)

g. Unique Tax Invoice Number
h. Invoice Date
i. IRN No, QR Code, Acknowledgment No and Acknowledgment Date generated from E-Invoice Portal as per E-invoicing provisions under GST Act (If applicable)
j. Place of Supply (as mentioned below)
k. Description of service provided
l. 8 Digit SAC code
m. GST Rate
n. Gross value of Invoice
o. Taxable Value
p. Tax / GST Amount
q. Total Invoice value including GST.

Above are inclusive and not exhaustive list of requirements.

2.7. Bidder should mention the "Bill To "and "Place of supply" as below in the Tax Invoice

Bill To: Location of BHEL Site office

---,

State: ----------
GSTN of BHEL: ----------

Place of Supply: Location of BHEL Site office

---,

State: ----------
GSTN of BHEL: ----------

(Above details will be given later, contractors may contact BHEL, PSSR before billing)

2.8. In case of supply of goods contract, the successful bidder must promptly provide details of the dispatched items on the same day they are removed for shipment to the BHEL site. This intimation must include all relevant information and documents about the goods and a scanned copy of the tax invoice. If any financial liabilities arise for BHEL due to non-compliance with GST laws resulting from the bidder's delay in providing this information, the bidder will be held liable, unless the delay is directly attributable to BHEL.

2.9. BHEL will reimburse the GST amount claimed by the Vendor/Contractor against a tax invoice along with the amount due to the contractor in the RAB. However, If the Vendor/Contractor fails to fulfill the GST compliance requirements detailed below for any preceding invoice, BHEL reserves the right to recover an amount equivalent to the reimbursed GST from the subsequent bills as a measure against statutory non-compliance. Additionally, an amount equivalent to the GST claimed in subsequent bills will be withheld until statutory compliance for the prior invoice is ensured.

In the case of one-time vendors/contractors or the Vendor/Contractor's final bill, BHEL will withhold an amount equivalent to the GST claimed from the same bill towards pending statutory compliance. This withheld amount will only be released once the following GST compliance requirements are fully satisfied.

GST Compliance Requirements:

a. Vendor / Contractor must provide the original copy of Tax invoice /debit note as per the prescribed format under the GST act within the prescribed time period in order to enable BHEL to avail input tax credit within the due date.

b. The details of the invoice or debit note referred to in clause (a) must be furnished/filed by the Vendor/ Contractor in the statement of outward supplies (presently in GSTR1 or IFF) and such details should

get reflected in the BHEL GST login (both in GSTR 2A and GSTR 2B) in the manner specified under GST Act.

c. Details of vendor/contractor invoice reflected in BHEL GST login should match with the details in the tax invoice submitted by the vendor/contractor, including the invoice number, invoice date, GSTIN, and place of supply. Additionally, the status of GSTR-1 and GSTR-3B filings must be "Yes."

d. The tax charged in the invoice /debit note referred to in clause (a) must be paid to the Government by the Vendor/Contractor, either in cash or through the utilization of input tax credit.

2.10 In case, any GST credit is delayed/denied to BHEL or BHEL has to incur any liability (like interest / penalty) due to non/delayed receipt of goods or submission of tax invoice after the expiry of timeline prescribed in the relevant GST Act for availing ITC, or any other reasons not attributable to BHEL, Then the same shall be recovered from the vendor/contractor along with interest levied/ leviable on BHEL.

2.11 GST shall be levied on recoveries, wherever applicable and same shall be recovered from payments. BHEL shall issue / raise Tax invoice on contractor/vendors for such recoveries.

2.12 E-way bills / Transit passes / Road Permits, if required for materials / T&P etc., bought into the project site is to be arranged by the Vendor / Contractor themselves. BHEL shall not issue or raise any Road Permit/ E- Way Bill for this purpose. Any claim or demand raised by the GST department for non- generation / non-submission of E-way bill shall be to the contractor/ vendor account

2.13 BHEL shall not reimburse any expenditure incurred by the contractor towards demand, additional liability or interest / penalty etc., raised by the GST department due to issues such as wrong rates / wrong classification of services or goods.

2.14 Where GST is payable by BHEL under reverse charge basis, any demand raised or any interest or penalty levied / leviable by the GST department due to non-submission or delayed submission of invoice by the contractor or for any other reason not attributable to BHEL, the same shall be recovered from the vendor/contractor.

2.15 Tax Deduction at Source (TDS) as per Sec 51 of the CGST Act shall be deducted (if applicable). GST TDS certificate in Form GSTR -7A shall be issued to be contractor. However, GST TDS certificate can be generated only if the contractor accepts the TDS details uploaded by BHEL and files his return. If any specific exemption from GST TDS is applicable to any contractor/vendor, then a declaration to that effect along with relevant documents as may be required by BHEL, substantiating such exemption in line with GST law provisions or notification, shall be submitted by the vendor/contractor.

For GST Unregistered bidder:

2.16 In case, bidder is not required to register under Goods and service Tax (GST) & Cess, the same is to be specified in the offer.

2.17 Successful bidder to furnish a Self-declaration that registration under GST is not required or not applicable as per the provisions of GST Law along with relevant document and provisions in the GST law.

2.18 In case BHEL has to incur any liability (like interest / penalty etc.) due to non-compliance of GST law in respect of the invoice submitted by the contractor, for the reasons attributable to the contractor, the same shall be recovered from the contractor.

2.19 TDS under GST (as & when applicable) shall be deducted at prevailing rates on gross invoice value.

2.20 If RCM is made applicable at a later date, GST will be paid by BHEL to the department at applicable rate treating the quoted the price as inclusive of GST if BHEL is not able to take Input tax credit.

2.21 In the event of any change in the status of bidder from unregistered to registered under the GST law after the submission of bid but before the completion of supply of services or goods, the same need to be intimated and all the clauses applicable for Registered bidder need to be followed. The vendor/ contractor is required to pass on the ITC benefit arising due to change of status, to BHEL. Contract value shall be amended accordingly. GST paid on the amended contract value shall be reimbursed at actuals against the Tax invoice only if BHEL is able to take input tax credit.

3 Statutory Variations

3.1 BHEL shall pay statutory variation only for GST, and no other variations shall be payable

3.2 In general, Statutory variation for GST is payable to the Vendor/Contractor during the contract period including extension thereof. Beyond the contract period, BHEL will reimburse the actual applicable tax only if BHEL is able to take the input tax credit. However, the decision of BHEL in this regard will be final and binding on the vendor/contractor

4 **New Taxes/Levies** –

In case Government imposes any new levy / tax after submission of bid 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. However, Contractor/ Vendor shall obtain prior consent from BHEL before depositing new taxes and duties.

Any benefits arise out of new tax levies and/or abolition of existing taxes must be passed on to BHEL.

The decision of BHEL in this regard will be final and binding on the vendor/contractor.

5 Direct Tax

5.1 Vendor/ Contractor is required to update himself on its own and comply with provisions of Indian Income Tax Act as notified from time to time. Purchaser shall not be liable towards liability of income tax accruing to the vendor/contractor of whatever nature including variations thereof, arising out of this Order/ Contract, as well as tax liability of the vendor/ Contractor and his personnel

5.2 Deductions of Tax at source as per Income Tax Act, at the prevailing rates shall be effected by the Purchaser before release of payment, as a statutory obligation, if applicable. TDS certificate will be issued by the Purchaser as per the statutory provisions. The Vendor/Contractor has to mention their Permanent Account Number (PAN) and GSTIN in all invoices.

6 BOCW Act & BOCW Welfare Cess Act

6.1 Contractor's price/rates shall be exclusive of BOCW Cess .

6.2 The Contractor should Register their Establishment under BOCW Act 1996 read with rules 1998 by submitting Form I (Application for Registration of Establishment) and Form IV (Notice Of Commencement / Completion of Building other Construction Work) to the respective Labour Authorities i.e.,

a. Assistant Labour Commissioner (Central) in respect of the project premises which is under the purview of Central Govt.–NTPC, NTPL etc.
b. Appropriate State authorities in respect of the project premises which is under the purview of State Govt.

6.3 The Contractor should comply with the provisions of BOCW Welfare Cess Act 1996 in respect of the work awarded to them by BHEL.

6.4 The contractor should ensure compliance regarding Registration of Building Workers as Beneficiaries, Hours of work, welfare measures and other conditions of service with particular reference to Safety and Health measures like Safety Officers, safety committee, issue of Personal protective equipments, canteen, rest room, drinking water, Toilets, ambulance, first aid centre etc.

6.5 The contractor irrespective of their nature of work and manpower (Civil, Mechanical, Electrical works etc) should register their establishment under BOCW Act 1996 and comply with BOCW Welfare Cess Act 1996.

6.6 Contractor shall make remittance of the BOCW Cess as per the Act in consultation with BHEL as per the rates in force (presently 1%). BOCW remittance should be made only after obtaining prior consent from BHEL. BHEL shall reimburse the same upon production of documentary evidence. However, BHEL shall not reimburse the fee paid towards the registration of establishment, fees paid towards registration of Beneficiaries and Contribution of Beneficiaries remitted.

6.7 Non-compliance to Provisions of the BOCW Act & BOCW Welfare Cess Act is not acceptable. In case of any non-compliance, BHEL reserves the right to withhold any sum as it deems fit. Only upon total compliance with the BOCW Act and the discharge of total payment of Cess (in consultation with BHEL) under the BOCW Cess Act by the Contractor, BHEL shall consider refund of the amounts.

VOLUME-IA PART – I CHAPTER IX

BOQ

1.9.1 BOQ

S.No.	DESCRIPTION	UOM	QUANTITY
Bill of Quantities for Package-A			
A	**PREPARATION OF DRAWING & OBTAINING STATUTORY APPROVAL**		
A1	Route survey, preparation of route drawing, Detailed SLD, Detailed 11/11.5kV and 11kV/433V substation drawing,11KV RMU/VCB drg., 11kV distribution drawing, Two/Four/Six/Eight pole structure arrangement drawing, Earthing layout, sag calculation for OH line & any other document /drawing as required by Electrical inspectorate and getting approval of above from statutory authority and also includes liaison with electrical inspectorate for field inspection and obtaining clearance certificate for charging the entire system in a phased manner as per site requirement (any number of times till completion of entire scope under this contract.)	Lump sum	1
Bill of Quantities for Supply			
B	**SUPPLY PORTION OF BOM FOR 11kV OH Lines/Cable Interconnection.**		
B.1	**11kV Supply Handling Items**		
B.1.A	**Interconnection Through HT Cables**		
B.1.A.1	Supply of Heat shrink type HT Outdoor termination kits of reputed make suitable for 3CX 185 sqmm 11kV XLPE insulated Armoured Aluminium Cables	Nos.	10
B.2	**11kV/11.5kV Substation Related Items.**		
B.2.1	Supply of Lightning arrestor set suitable for 11kV as per ISS/IEC Spec No. IS:3070/2-1985/Latestt. (Each set consist of all 3 Phases).	Sets	2
B.2.2	Supply of 11kV HG Fuse set as per IS 9385(Each set consist of all 3 Phases).	Sets	2
B.2.3	Supply of 11kV pin insulator with GI pin as per IS:731 and IS:2486 Part-II. (Each set consist of all 3 Phases).	Sets	2

S.No.	DESCRIPTION	UOM	QUANTITY
B.2.4	Supply of 11kV disc insulator with fixing arrangements & conductor holding clamps as per IS:3188/1965 & IEC 309/1969/Latest. (Each set consist of all 3 Phases).	Sets	4
B.2.5	Supply of 11kV pin insulator with pins as per IS: 2544 & IEC 60168 Latest. (Each set consist of all 3 Phases).	Sets	2
B.2.6	Supply of 11kV 400A Air break switch-double break-horizontal mounting rotating type as per ISS/IEC Spec No.4710/1968-265-C/1970/Latest.	Nos.	2
B.2.7	Supply of 11kV DO fuse as per ISS/IEC Latest. (Each set consist of all 3 Phases)	Sets	2
B.2.8	ISMC-100 for cross beam for Overhead line two/four/six/eight pole steel structure at Sub Station.	MT	1
B.2.9	ISMC-75 for cross beam for Overhead line two/four/six/eight pole steel structure at Sub Station.	MT	1
B.2.10	Supply of 2kVA 230V 1 phase sine wave UPS of reputed make with 2 nos. of exide make 150AH 12V tubuler lead acid batteries. Vendor shall specify the make for which he is quoting in the bid and shall submit relevant certificates along with supply.	Sets	2
B.2.11	Supply of 50kVA 3 phase 4 wire 11kV/433V copper wound DYN11 oil filled out door plinth mounted Distribution transformer of reputed make to provide power supply to 11/11.5kV sub station and illumination etc.	Nos.	1
B.2.12	Supply of 125A out door type Floor mounted Power distribution board (PDB), IP 55 protection, Double Door type, Incomer-01 no. 125A TPN MCCB. Outgoing-02 nos. 63A TPN ELCBs with 30mA tripping, 03 nos. 40A TPN ELCBs with 30mA tripping, 02 nos. 32 A TPN ELCBs with 30mA tripping withTimer & contactors for auto on/off and 3 indicating lamps with fuse for indication bus supply ON, Digital voltmeter & VSS 0-500V, suitable bus bar arrangement for phase and neutral. Sufficient space should be provided in the removable cable gland plate to accommodate minimum 1R 3.5Cx185 sq. mm. incoming cable and outgoing cables of different	Nos.	1

S.No.	DESCRIPTION	UOM	QUANTITY
	sizes. All MCCB, MCBs and ELCBs shall be of reputed make.		
B.2.13	Supply of operator remote control desk/Relay control panel with chair for operating the 11kV/11.5kV Substation consisting of two Nos. of 2.5 MVA and 50kVA, 11kV/11.5kV and 11kV/0.440kV Transformers & of 11kV RMUs. This remote control desk/relay control panel shall control all operation points of Substation i.e control supply on status, UPS and battery healthiness, main supply on status for 11kV/11.5kV and 11kV/0.440kV transformers and VCB's.Other healthiness monitoring which includes breaker on/off status, trip circuit healthy indication, relay coordinations & trip alarm annunciation window etc. The panel shall be approved by BHEL.	Set	1
B.3	**11kV Overhead Ring Main Line Related Items.**		
B.3.1	Supply of ACSR RACCOON conductors as per IS:398 / Latest (To meet 3 phases/lines)	Meters	6300
B.3.2	Supply of ISMC-100 for cross beam for Overhead line two/four pole steel structure.	MT	6
B.3.3	Supply of ISMC-75 for cross beam for Overhead line two/four pole steel structure.	MT	1
B.3.4	Supply of 11kV 'V' Cross arms/Straight Arm with suitable back clamps including supply of necessary fasteners as per IE specification.	Nos.	60
B.3.5	Supply of 11kV GI stay (7/3.15mm) sets with Guy, Bow, Stay Rod, wire etc. as per I.E. Specifications. (Each set consist of all 3 Phases).	Sets	60
B.3.6	Supply of 11kV top fittings (I Clamp) with suitable back clamps including supply of necessary fasteners as per IE specification.	Nos.	60

S.No.	DESCRIPTION	UOM	QUANTITY
B.3.7	Supply of 11kV disc insulator with fixing & conductor and holding clamp as per IS: 3188/1965, IEC 60471 & IEC 309/Latest. (Each set consist of all 3 Phases).	Sets	20
B.3.8	Supply of 11kV pin insulator with pins as per IS: 2544 & IEC 60168 Latest. (Each set consist of all 3 Phases).	Sets	60
B.3.9	Supply of 11kV 400A Air break switch-double break-horizontal mounting rotating type as per ISS/IEC Spec No.4710/1968-265-C/1970/Latest.	Nos.	17
B.3.10	Supply of 11kV 400A Air break switch-double break-Vertical mounting rotating type as per ISS/IEC Spec No.4710/1968-265-C/1970/Latest.	Nos.	11
B.3.11	Supply of 11kV Lightning arrestor set as per ISS/IEC Spec No. IS:3070/2-1985/Latest. (Each set consist of all 3 Phases).	Sets	11
B.3.12	Supply of 11kV HG fuse as per ISS/IEC Spec IS: 9385/Latest. (Each set consist of all 3 Phases)	Sets	11
B.3.13	Supply of 11kV DO fuse as per ISS/IEC Latest. (Each set consist of all 3 Phases)	Sets	11
B.3.14	Supply of Heat shrink type HT Outdoor termination kits of reputed make suitable for 3CX 95 sqmm 11kV Armoured Aluminium XLPE insulated Cables	Nos.	11
B.3.15	Supply of Heat shrink type HT Outdoor termination kits of reputed make suitable for 3CX 185 sqmm 11kV XLPE insulated Armoured Aluminium Cables	Nos.	8
B.3.16	Supply of out door type weather proof 630A capacity 11kV Pillar box IP 55 Protection as per IS with one no. Incoming and two nos. outgoing including supply of accessories.	Nos.	4
B.3.17	Supply and fixing of anti climb device (barbed wire) rolled on the poles at 2m height as per I.E. specification and numbering of poles.	Sets	60
B.4	**Common Items for 11kV OH Lines and Substation Equipments.**		
B.4.1	Supply of Double compression type brass cable glands of reputed make for 3.5C x 185 Sq. mm armoured Aluminium LT cable	Nos	2

S.No.	DESCRIPTION	UOM	QUANTITY
B.4.2	Supply of Double compression type brass cable glands of reputed make for 3.5C x 70 Sq. mm Aluminium armoured LT cable	Nos	14
B.4.3	Supply of Double compression type brass cable glands of reputed make for 3.5C x 25 Sq. mm armoured Aluminium LT cable	Nos	12
B.4.4	Supply of 5Cx2.5sqmm PVC insulated copper PVC sheathed LT Power Cable suitable for CT and PT Wiring from VCB's to Control Panels.	Meters	1000
B.4.5	Supply of 3Cx2.5sqmm PVC insulated copper PVC sheathed LT Power Cable suitable for extending AC/DC control supply to VCB's and Xmers.	Meters	1000
B.4.6	Supply of 7C/9C/10Cx1.5sqmm PVC insulated copper PVC sheathed LT Control Cable suitable for extending alarm, annunciation and protection VCB's and Xmers.	Meters	1000
B.4.7	Supply of 1Cx10sqmm PVC insulated PVC sheathed copper LT Control Cable suitable for earthing of high mast ligtning arrangements.	Meters	300
B.4.8	Supply of 65x10 mm GI earth flat.	Meters	310
B.4.9	Supply of 50x6 mm GI earth flat.	Meters	289
B.4.10	Supply of 25x3 mm GI earth flat.	Meters	265
B.4.11	Supply of 8SWG wire	Meters	2100
B.4.12	Supply of Required MS/GI/Nickel cadmium fasteners/anchor fasteners for erection of all supply materials and completion of entire works covered under this package (M6 to M16).	kg	100
B.4.13	**VOID**		
B.4.14	Supply of Heat shrink type HT straight through jointing kits of reputed make for 3Cx185 sqmm 11kV XLPE insulated Aluminium Armoured Cables.	Nos.	8
B.4.15	Supply of Heat shrink type HT Indoor termination kits of reputed make suitable for 11kV 3Cx95 sqmm XLPE insulated Aluminium Armoured Cables.	Nos.	11
B.4.16	Supply of Heat shrink type HT straight through jointing kits of reputed make for 11kV 3Cx95 sqmm XLPE insulated Aluminium Armoured Cables.	Nos.	3
B.4.17	Supply of 200mm dia RCC hume pipes for make use of cable crossing where ever required such as	Meters	165

S.No.	DESCRIPTION	UOM	QUANTITY
	existing culverts, trenches and road etc for HT Cables.		
B.4.18	Supply of 150mm NB 4.8mm thick medium class GI pipes for make use of cable crossing where ever required such as existing culverts, trenches and road etc for for LT Cables.	Meters	80
B.4.19	Suppy and fixing of 11kV and 440 V danger board of standard size.	Nos.	44
B.4.20	Supply and fixing of Fire Buckets with stand floor mounted type of rigid & good quality-4 nos. 10 ltr capacity Fire buckets per stand-Type & make shall be approved by BHEL/ Engineer.	Sets	12
B.4.21	Supply and fixing of Aluminium alloy 5kg CO2 fire extinguisher industrial type with ISI Mark of reputed make. Type & make shall be approved by BHEL/ engineer.	Nos.	12
B.4.22	Supply and erection of HT cable route markers standard size with 1m height angle support.	Nos.	65
B.4.23	Supply and erection of LT cable route markers standard size with 1m height angle support.	Nos.	125
B.4.24	Supply and fixing of Griddle Guards of length 15m, with 8SWG GI Wire for Road crossing with necessary fixing arrangement etc, as per IS Specification.	Sets	4
B.5	**FOR AREA LIGHTING Related Items.**		
B.5.1	**For Contruction Power Supply Area & its Route**		
B.5.1.1	Supply of steel tubular swaged poles, 9 mtr long made of sheet steel having ultimate tensile strength 42 kg F/sq. mm conforming to BIS: 2713 (part-II) complete with 300x300x6 mm thick MS base plate for welding at site and size as per configuration given in BIS for 410 SP-28 (113 kg- pole weight) . Suitable Electrical junction box (GI/PVC)of good quality to suit the opening availabe in above lighting pole, one connector block for 3 Phase 4 wire incoming and outgoing cable to next street light pole with 01 no. 6A SP MCB for street light and earthing etc. Make shall be approved by BHEL Engineer	Nos.	60

S.No.	DESCRIPTION	UOM	QUANTITY
B.5.1.2	Supply of weather proof 90W LED street light fitting of make Philips/CGL/Bajaj/Havells or equivalent make along with IP 66 protection, complete with one piece of appropriate driver (integral/non-integral) and suitable for directly slipping over light mounting bracket specified at B.5.1.1 above along with other accesories, cabling upto Junction Box & termination of items supplied.	Nos.	60
B.5.1.3	Supply of 2Cx2.5sqmm size Armoured copper PVC insulated cable confirming to IS 1554(part-I)of reputed make.	Meters	7600
B.5.1.4	Supply of 50mm NB 3.6mm thick medium class standard GI pipe for incoming and outgoing cables.	Meters	120
B.5.1.5	Supply of out door type metal clad Lighting distribution board (LDB) having IP-55 protection with double door type and one incomer with 100A TPN MCCB additionally with 3 nos. 32 A TPN ELCBs with 30mA tripping and timer & contactors for auto on/off street lights and 3 indicating lamps with fuse for indication bus supply ON, Digital Voltmeter & VSS 0-500V etc. Suitable busbar arrangement for Phase and Neutral. Sufficient space should be provided in the removable cable gland plate to accommodate incoming power cable and all outgoing cables.	Nos.	6
B.5.2	**For Open Storage Yard**		
B.5.2.1	Supply of steel tubular swaged poles, 9 mtr long made of sheet steel having ultimate tensile strength 42 kg F/sq. mm conforming to BIS: 2713 (part-II) complete with 300x300x6 mm thick MS base plate for welding at site and size as per configuration given in BIS for 410 SP-28 (113 kg- pole weight) . Suitable Supply of Electrical junction box (GI/PVC)of good quality to suit the opening availabe in above lighting pole, one connector block for 3 Phase 4 wire incoming and outgoing cable to next street light pole with 01 no. 6A SP MCB for street light and earthing etc. also to be provided.	Nos.	72

S.No.	DESCRIPTION	UOM	QUANTITY
B.5.2.2	Supply of weatherproof 150W LED street light fitting of make Philips/CGL/Bajaj/Havells or equivalent make along with IP 66 protection, complete with one piece of appropriate driver (integral/non-integral) and suitable for directly slipping over light mounting bracket made of 40mm OD pipe specified at B.5.2.1 above along with other accesories, cabling upto Junction Box & termination of items supplied.	Nos.	72
B.5.2.3	Supply of 50mm NB 3.6mm thick mediumclass GI pipe for incoming and outgoing cables.	Mtrs	144
B.5.2.4	Supply of 3-Phase metering and power distribution board complete with: (1) Incoming SFU TPN 400 Amps - 1no, (2) Outgoing SFU TPN 200 Amps -1nos. (3) Outgoing SFU TPN 63 Amps -1nos. (4) Outgoing SFU TPN 32 Amps -7nos. 3 Phase Electronic Energy Meter - BHEL / L&T / GEC make. Ammeter, Voltmeter and Selector Switches for both - AE and Kaycee make. Phase indication lamps, HRC fuses for IC and OG feeders, cable glands, power terminals for cables termination, cable lugs and provision for doubly earthing the panel enclosure. Panel enclosure shall be made of sheet metal thichnness not less than 1.6 mm and suitable for out door installation, modular construction, hinged door with locking arrangement, base frame, should have sloped canopy, duly painted with first coat of primer and two coats of synthetic enamel paint (interior with white paint and exterior with light grey as per shade 5, is 630) internal power distribution to devices shall be with Aluminium busbars or copper flexible single core PVC cables of 1.1 kV grade, control wiring with 1.5 sqmm, suitable stool made out of MS structure of 1.2 meter high for mounting of panel with anchoring arragement at foundation, suitable for bottom entry of cables.	Nos.	1

S.No.	DESCRIPTION	UOM	QUANTITY
B.5.2.5	Supply of out door type metal clad Lighting distribution board (LDB) having IP-55 protection with double door type and one incomer with 100A TPN MCCB additionally with 3 nos. 32 A TPN ELCBs with 30mA tripping and timer & contactors for auto on/off street lights and 3 indicating lamps with fuse for indication bus supply ON, Digital Voltmeter & VSS 0-500V etc. Suitable busbar arrangement for Phase and Neutral. Sufficient space should be provided in the removable cable gland plate to accommodate incoming power cable and all outgoing cables.	Nos.	3
B.5.2.6	Supply of 2Cx6 sqmm Aluminium Armoured XLPE insulated cable confirming to IS 7098 (part-I) respectively along with double compression type brass cable glands, required nos of termination lugs, Jointing kits, Straight throughs and suitable glands.	Meters	7200
B.5.2.7	Supply of Double compression type brass cable glands of reputed make for 3.5C x 95 Sq. mm Aluminium LT cable	Nos	6
B.5.2.8	Supply of Double compression type brass cable glands of reputed make for 3.5C x 185 Sq. mm Aluminium LT cable	Nos	6
	Bill of Quantities for Erection, Testing and Commissioning		
C	**Erection, Testing and Commissioning BOQ Items.**		
C.1	**11kV Supply Handling Items**		
C.1.A	**Interconnection Through HT Cables**		
C.1.A.1	Laying of 11kV 3Cx185 sqmm sqmm Armoured HT Cable on existing cable tray/rack from cutomer's Stage-I 11KV Switchgear to Stage II to Project area .	Meters	4600
C.1.A.2	Erection of Heat shrink type HT Outdoor termination kits suitable for 11kV 3Cx185 sqmm Armoured Cables.	Nos.	10
C.2	**11kV/11.5kV Substation Related Items.**		
C.2.1	Erection of 11kV Lightning arrestor set as per ISS/IEC Spec No. IS:3070/2-1985/Latest. (Each set consist of all 3 Phases).	Sets	2
C.2.2	Erection of 11kV HG Fuse set as per IS (Each set consist of all 3 Phases).	Sets	2

S.No.	DESCRIPTION	UOM	QUANTITY
C.2.3	Erection of 11kV pin insulator with GI pin as per IS:731 and IS:2486 Part-II. (Each set consist of all 3 Phases).	Sets	8
C.2.4	Erection 11kV disc insulator with fixing arrangements & conductor holding clamps as per IS:3188/1965 & IEC 309/1969/Latest. (Each set consist of all 3 Phases).	Sets	4
C.2.5	Erection of 11kV pin insulator with pins as per IS: 2544 & IEC 60168 Latest. (Each set consist of all 3 Phases)..	Sets	2
C.2.6	Erection of 11kV 400A Air break switch-double break-horizontal mounting rotating type as per ISS/IEC Spec No.4710/1968-265-C/1970/Latest.	Nos.	2
C.2.7	Erection of 11kV DO fuse as per ISS/IEC Latest. (Each set consist of all 3 Phases)	Sets	2
C.2.8	Erection of Rail Pole 52kgs 13 meter for Overhead line two/four/six/eight pole steel structure at Sub Station.The erection includes excavation of earth of size 1x1x1.8m depth, fasteners, foundtation bolt, grouting with concrete of ratio 1:4:8 for size of 1x1x1.8m depth including supply of cement, sand, metal etc for the foundation and coping of poles by 1 feet height.	Nos.	8
C.2.9	Erection of ISMC-100 for cross beam for Overhead line two/four/six/eight pole steel structure at Sub Station.	MT	1
C.2.10	Erection of ISMC-75 for cross beam for Overhead line two/four/six/eight pole steel structure at Sub Station.	MT	1
C.2.11	Erection, testing and commisioning of Ring Main Unit Panel as applicable as per BHEL Technical Specifications including 230 V AC/220/110 V DC Power Pack/ SMPS Facility Power Supply for control circuit inside the panel.	Nos.	2
C.2.12	Erection, testing and commisioning of 2kVA 230V 1 phase sine wave UPS of reputed make with 2 nos. of exide make 150AH 12V tubuler lead acid batteries.	Sets	2

S.No.	DESCRIPTION	UOM	QUANTITY
C.2.13	Erection, testing and commisioning, including oil filteration and submission of oil test report of 50kVA 3 phase 4 wire 11kV/433V copper wound DYN11 oil filled out door plinth mounted Distribution transformer of reputed make to provide power supply to 11/11.5kV sub station and illumination etc.	Nos.	1
C.2.14	Erection, testing and commisioning of 125A out door type Floor mounted Power distribution board (PDB), IP 55 protection, Double Door type, Incomer-01 no. 125A TPN MCCB. Outgoing-02 nos. 63A TPN ELCBs with 30mA tripping, 03 nos. 40A TPN ELCBs with 30mA tripping, 02 nos. 32 A TPN ELCBs with 30mA tripping withTimer & contactors for auto on/off and 3 indicating lamps with fuse for indication bus supply ON, Digital voltmeter & VSS 0-500V, suitable bus bar arrangement for phase and neutral. Sufficient space should be provided in the removable cable gland plate to accommodate minimum 1R 3.5Cx185 sq. mm. incoming cable and outgoing cables of different sizes. All MCCB, MCBs and ELCBs shall be of reputed make.	Nos.	1
C.2.15	Erection, testing and commisioning, including oil filteration and submission of oil test report of 11kV/11.5kV, 2.5MVA oil filled outdoor transformer as per BHEL Technical Specifications.	Nos.	2
C.2.16	Erection, testing and commisioning of Ring Main Unit Panel as applicable as per BHEL Technical Specifications including 230 V AC/220/110 V DC Power Pack/ SMPS Facility Power Supply for control circuit inside the panel.	Nos.	2
C.2.17	Erection, testing and commisioning of operator remote control desk/Relay control panel with chair for operating the 11kV/11.5kV Substation consisting of 2 Nos. of 2.5 MVA and 50kVA, 11kV/11.5kV and 11kV/0.440kV Transformers & 4 Nos. of 11kV outdoor VCB/ RMU. This remote control desk/relay control panel shall control all operation points of Substation i.e control supply on status, UPS and battery healthiness, main supply on status for 11kV/11.5kV and 11kV/0.440kV transformers and VCB's/ RMUs.Other healthiness monitoring which	Set	1

S.No.	DESCRIPTION	UOM	QUANTITY
	includes breaker on/off status, trip circuit healthy indication, relay coordinations & trip alarm annunciation window etc. The panel shall be approved by BHEL.		
C.3	**11kV Overhead Ring Main Line Related Items.**		
C.3.1	Stringing of ACSR RACOON conductors as per IS:398/Latest (To meet 3 phases/lines)	Meters	6300
C.3.2	Erection of Rail Pole 52kgs 13 meter The erection includes excavation of earth of size 1x1x1.8m depth, grouting with concrete of ratio 1:4:8 for size of 1x1x1.8m depth including supply of cement, sand, metal etc. for the foundation and coping of poles by 1 feet height.	Nos.	60
C.3.3	Erection of Rail Pole 52kgs 13 meter for 11kV Overhead line two/four/six/eight pole steel structure.The erection includes excavation of earth of size 1x1x1.8m depth, fasteners, foundtation bolt, grouting with concrete of ratio 1:4:8 for size of 1x1x1.8m depth including supply of cement, sand, metal etc for the foundation and coping of poles by 1 feet height.	Nos.	34
C.3.4	Erection of ISMC-100 for cross beam for Overhead line two/four/six/eight pole steel structure.	MT	6
C.3.5	Erection of ISMC-75 for cross beam for Overhead line two/four/six/eight pole steel structure.	MT	1
C.3.6	Erection of 11kV 'V' Cross arms/Straight Arm with suitable back clamps including erection of necessary fasteners as per IE specification.	Nos.	60
C.3.7	Erection of 11kV GI stay (7/3.15mm) sets with Guy, Bow, Stay Rod, wire etc. as per I.E. Specifications. (Each set consist of all 3 Phases).	Sets	60

S.No.	DESCRIPTION	UOM	QUANTITY
C.3.8	Erection of 11kV top fittings (I Clamp) with suitable back clamps including erection of necessary fasteners as per IE specification.	Nos.	60
C.3.9	Erection of 11kV disc insulator with fixing & conductor and holding clamp as per IS: 3188/1965 & IEC 309/1969/Latest. (Each set consist of all 3 Phases).	Sets	20
C.3.10	Erection of 11kV pin insulator with pins as per IS: 2544 & IEC 60168 Latest. (Each set consist of all 3 Phases).	Sets	60
C.3.11	Erection of 11kV 400A Air break switch-double break-horizontal mounting rotating type as per ISS/IEC Spec No.4710/1968-265-C/1970/Latest.	Nos.	17
C.3.12	Erection of 11kV 400A Air break switch-double break-vertical mounting rotating type as per ISS/IEC Spec No.4710/1968-265-C/1970/Latest.	Nos.	11
C.3.13	Erection of 11kV Lightning arrestor set as per ISS/IEC Spec No. IS:3070/2-1985/Latest. (Each set consist of all 3 Phases).	Sets	11
C.3.14	Erection of 11kV HG fuse as per ISS/IEC Spec IS: 9385/Latest. (Each set consist of all 3 Phases)	Sets	11
C.3.15	Erection of 11kV DO fuse as per ISS/IEC Latest. (Each set consist of all 3 Phases)	Sets	11
C.3.16	Laying of 11kV 3Cx95sqmm Armoured HT Cable	Meters	600
C.3.17	Erection of Heat shrink type HT Outdoor termination kits of reputed make suitable for 3CX 95 sqmm 11kV Armoured Cables	Nos.	11
C.3.18	Laying of 11kV 3Cx95sqmm Armoured HT Cable on existing cable trays/racks	Meters	1100
C.3.19	Laying of 11kV 3Cx185sqmm Armoured HT Cable	Meters	900
C.3.20	Erection of Heat shrink type HT Outdoor termination kits of reputed make suitable for 3CX 185 sqmm 11kV Armoured Cables	Nos.	8
C.3.21	Erection, testing and commisioning of 500kVA, 11kV/433V Compact Package Substations (consisting of dry type transformers) as per BHEL Technical Specifications.	Nos.	10

S.No.	DESCRIPTION	UOM	QUANTITY
C.3.22	Erection, testing and commisioning, including oil filteration and submission of oil test report of 500kVA, 11kV/0.440kV Package Substations as per BHEL Technical Specifications.	Nos.	1
C.3.23	Erection, testing and commisioning of out door type weather proof 630A capacity 11kV Pillar box IP 55 Protection as per IS with one no. Incoming and two nos. outgoing.	Nos.	4
C.4	**Common Items for 11kV OH Lines and Substation Equipments.**		
C.4.1	Laying of 3.5Cx185sqmm LT Power Cable for interconnection of LTDB with Package Substation.	Meters	500
C.4.2	Termination of 3.5Cx185sqmm LT Power Cable along with supply of aluminium lug of reputed make suitable for interconnection of LTDB with Package Substation.	Nos.	2
C.4.3	Laying of 3.5Cx70sqmm LT Power Cable for Lighting LDB &50 kVA Aux. Transformer.	Meters	2000
C.4.4	Termination of 3.5Cx70sqmm LT Power Cable along with supply of aluminium lug of reputed make suitable for Lighting LDB &50 kVA Aux. Transformer.	Nos.	14
C.4.5	Laying of 3.5Cx25sqmm LT Power Cable for High Mast.	Meters	1950
C.4.6	Termination of 3.5Cx25sqmm LT Power Cable along with supply of aluminium lug of reputed make suitable for High Mast.	Nos.	12
C.4.7	Laying and termination of 5Cx2.5sqmm LT Power Cable including supply of double compression type brass cable glands and required number of termination lugs of reputed make suitable for CT and PT Wiring from VCB's to Control Panels.	Meters	1000
C.4.8	Laying and termination of 3Cx2.5sqmm LT Power Cable inclusinf supply of double compression type brass cable glands and required number of termination lugs of reputed make suitable for extending AC/DC control supply to VCBs.	Meters	1000
C.4.9	Laying and termination of 7C/9C/10Cx1.5sqmm LT Control Cable including supply of double compression type brass cable glands and required number of termination lugs of reputed make	Meters	1000

S.No.	DESCRIPTION	UOM	QUANTITY
	suitable for extending alarm, annunciation and protection VCBs.		
C.4.10	Laying and termination of 1Cx10sqmm LT Control Cable along with double compression type brass cable glands and required number of termination lugs of reputed make suitable for earthing of high mast ligthing arrangements.	Meters	300
C.4.11	Erection of 65 x 10 mm GI earth flat.	Meters	310
C.4.12	Erection of 50 x 6 mm GI earth flat.	Meters	289
C.4.13	Erection of 25 x 3 mm GI earth flat.	Meters	265
C.4.14	Erection of 8SWG wire.	Meters	2100
C.4.15	Erection of Heat shrink type HT straight through jointing kits of reputed make for 11kV 3Cx185 sqmm Armoured Cables.	Nos.	8
C.4.16	Erection of Heat shrink type HT Indoor termination kits of reputed make suitable for 11kV 3Cx95 sqmm Cables.	Nos.	11
C.4.17	Erection of Heat shrink type HT straight through jointing kits of reputed make for 11kV 3Cx95 sqmm Cables.	Nos.	3
C.4.18	Erection of 200 mm dia RCC hume pipes for rmake use of cable crossing where ever required such as existing culverts, trenches and road etc for HT Cables.	Meters	165
C.4.19	Erection of 150mm NB 4.8mm thick medium class GI pipes for make use of cable crossing where ever required such as existing culverts, trenches and road etc for for LT Cables.	Meters	80
C.5	**FOR AREA LIGHTING Related Items.**		
C.5.1	**For Contruction Power Supply Area & its Route**		
C.5.1.1	Installation/Erection of steel tubular swaged poles, 9 mtr long made of sheet steel having ultimate tensile strength 42 kg F/sq. mm conforming to BIS: 2713 (part-II) complete with 300x300x6 mm thick MS base plate for welding at site and size as per configuration given in BIS for 410 SP-28 (113 kg- pole weight) with 1.5 mtr deep exacavation, concreting in 1:4:8 ratio size 45 cms x 45 cms x 150 cms and pole plinth in	Nos.	60

S.No.	DESCRIPTION	UOM	QUANTITY
	1:3:6 cement concreting having 300 mm height and 300 mm dia including double earthing of pole with suitable arrangement, duly painted with two coats of red oxide paint and one coat of aluminium paint to be applied after erection; the length of pole below ground to be painted with two coats of black bituminus paint. the pole shall be complete with Junction Box, GI Pipe for incoming and outgoing cables fuse and minor fabrication as below : i) Driling 20 mm dia hole at about 2.5 mtr from ground level for wire leads from junction box to light fixture. ii) Driling 15mm dia holes at about 0.7 and at 2.5 mtr from ground level and welding 12 mm nuts for using a 12 mm GI bolt for fastening earth conducters. iii) Welding required holes for fixing pole cap of street light bracket. iv) Welding diametrally 10 mm MS round 30 mm below pole top edge for clipping wire leads .		
C.5.1.2	Erection of 90W LED street light fitting with all accessories along with cabling and termination.	Nos.	60
C.5.1.3	Cable Laying and Termination of 2Cx2.5sqmm size copper PVC/ XLPE insulated cable confirming to IS1554 (Part-I) insulated cable of reputed make including supply of lugs, glands, etc.	Meters	7600
C.5.1.4	Erection, testing and commissioning of out door type metal clad Lighting distribution board (LDB) having IP-55 protection with double door type and one incomer with 100A TPN MCCB additionally with 3 nos. 32 A TPN ELCBs with 30mA tripping and timer & contactors for auto on/off street lights and 3 indicating lamps with fuse for indication bus supply ON, Digital Voltmeter & VSS 0-500V etc. Suitable busbar arrangement for Phase and Neutral. Sufficient space should be provided in the removable cable gland plate to accommodate incoming power cable and all outgoing cables.	Nos.	6

S.No.	DESCRIPTION	UOM	QUANTITY
C.5.1.5	Erection, Earthing and Charging of High Mast (30 Meters) along with its Accessories.(High Masts Lights consisting of Mast shaft in multiple sections, head frame, steel wire rope, double drum winch, galvanized lantern carriage, luminairies and their control gear boxes, aviation obstruction lights, control/feeder panel etc. complete with all other accessories and interconnecting cables) (Excluding Civil Works)	Sets	6
C.5.2	**For Open Storage Yard**		
C.5.2.1	Installation/Erection of steel tubular swaged poles, 9 mtr long made of sheet steel having ultimate tensile strength 42 kg F/sq. mm conforming to BIS: 2713 (part-II) complete with 300x300x6 mm thick MS base plate for welding at site and size as per configuration given in BIS for 410 SP-28 (113 kg- pole weight) with 1.5 mtr deep exacavation, concreting in 1:4:8 ratio size 45 cms x 45 cms x 150 cms and pole plinth in 1:3:6 cement concreting having 300 mm height and 300 mm dia including double earthing of pole with suitable arrangement, duly painted with two coats of red oxide paint and one coat of aluminium paint to be applied after erection; the length of pole below ground to be painted with two coats of black bituminus paint. the pole shall be complete with Junction Box, fuse and erection fo GI Pipe for incoming and outgoing cables and minor fabrication as below : i) Driling 20 mm dia hole at about 2.5 mtr from ground level for wire leads from junction box to light fixture. ii) Driling 15mm dia holes at about 0.7 and at 2.5 mtr from ground level and welding 12 mm nuts for using a 12 mm GI bolt for fastening earth conducters. iii) Welding required holes for fixing pole cap of street light bracket and fabricating and fixing mounting bracket made out of 40mm OD pipe iv) Welding diametrally 10 mm MS round 30 mm below pole top edge for clipping wire leads .	Nos.	72

S.No.	DESCRIPTION	UOM	QUANTITY
C.5.2.2	Installation/Erection & Commissioning of LED street light fitting 150 watt of Bajaj, crompton, Philips or equivalent make, complete with one piece of appropriate driver (integral/non-intigral) and directly slipping over light mounting bracket made out of 40 mm OD pipe and suitable for lamps, JB, cabling & termination of items supplied.	Nos.	72
C.5.2.3	Providing suitable foundation for mounting AC distribution board as specified and Installation/Erection and Commissioning of 3-Phase metering and power distribution board complete with: (1) Incoming SFU TPN 400 Amps - 1no, (2) Outgoing SFU TPN 200 Amps -1nos. (3) Outgoing SFU TPN 63 Amps -1nos. (4) Outgoing SFU TPN 32 Amps -7nos. 3 Phase Electronic Energy Meter - BHEL / L&T / GEC make. Ammeter, Voltmeter and Selector Switches for both - AE and Kaycee make. Phase indication lamps, HRC fuses for IC and OG feeders, cable glands, power terminals for cables termination, cable lugs and provision for doubly earthing the panel enclosure. Panel enclosure shall be made of sheet metal thichnness not less than 1.6 mm and suitable for out door installation, modular construction, hinged door with locking arrangement, base frame, should have slopped canopy, duly painted with first coat of primer and two coats of synthetic enamel paint (interior with white paint and exterior with light grey as per shade 5, is 630) internal power distribution to devices shall be with al busbars or copper flexible single core PVC cables of 1.1 kV grade, control wiring with 1.5 sqmm, suitable stool made out of MS structure of 1.2 meter high for mounting of panel with anchoring arragement at foundation, suitable for bottom entry of cables.	Nos.	1

S.No.	DESCRIPTION	UOM	QUANTITY
C.5.2.4	Erection, testing and commissioning of out door type metal clad Lighting distribution board (LDB) having IP-55 protection with double door type and one incomer with 100A TPN MCCB additionally with 3 nos. 32 A TPN ELCBs with 30mA tripping and timer & contactors for auto on/off street lights and 3 indicating lamps with fuse for indication bus supply ON, Digital Voltmeter & VSS 0-500V etc. Suitable busbar arrangement for Phase and Neutral. Sufficient space should be provided in the removable cable gland plate to accommodate incoming power cable and all outgoing cables.	Nos.	3
C.5.2.5	Cable Laying and Termination of 2Cx6 sqmm Aluminium Armoured PVC insulated cable including supply of cable glands, lugs, etc.	Meters	7200
C.5.2.6	Laying of 3.5CX95 sqmm Aluminium Armoured Cable	Meters	800
C.5.2.7	Making of end termination of 3.5Cx95 sq.mm LT Power cable including supply of Aluminium lugs	Nos.	6
C.5.2.8	Laying of 3.5CX185 sqmm Aluminium Armoured Cable	Meters	1568
C.5.2.9	Making of end termination of 3.5Cx185 sq.mm LT Power cable including supply of Aluminium lugs	Nos.	6
Bill of Quantities for Civil Related Works			
D	**SUPPLY & ERECTION PORTION OF BOM FOR CIVIL RELATED WORKS.**		
D.1	**For 11kV/11.5kV Substation Related Civil Works**		
D.1.1	Leveling of substation yard, supply and spreading of 40mm size stone aggregate of 100 mm thick for an area of size approx 40x25m, supply and construction of brick work with cement mortar 1:6 of 230 mm thick and 450 mm height all around the substation yard, plastering the brick work in CM 1:6 etc. Tentative detail as specified under and may varry as per site conditions..		
D.1.1a	Excavation -Eartwork (300mm)	CUM	67.5
D.1.1b	Backfilling-Earthwork (300mm)	CUM	20
D.1.1c	Brickwork (230mm)	CUM	4.75594
D.1.1d	40 mm size stone aggregate or pebbles	CUM	9

S.No.	DESCRIPTION	UOM	QUANTITY
D.1.1e	Bottom PCC (M 10- 1:3:6) for helding oil from seepage into earth	CUM	22.5
D.1.2	Supply & Erection of 3m long 50mm dia 3.6 mm thick medium class GI funnel type earth electrode with filling of bentonite earthing powder as per standard, along with required materials for four side brick work chamber with cement plastering and removable type RCC/ cast iron cover plate. Scope includes supply of required bentonite earthing powder, cement, brick, sand, RCC/cast iron cover plate.	Nos.	14
D.1.3	Construction of 5mx4m size 3m high Control room, including supply of required civil materials like cement, sand, bricks, metal, reinforcement rods etc. The control room is concrete roof, brick wall room with inside & out site plastering, cement flooring with necessary trench arrangements for control desk & UPS and two nos 4x4 ft glass alu. slide type windows, one door of normal size (2.1x1.2m) with lock & key arrangement including painting of control room. Supply & providing of control room lighting with minimum 4 nos. of 40 W Tube light fitting, 2 nos. 1200 sweep ceiling fans and 4 nos of 40 W LED street light fitting for out side area lighting, necessary elecrical wiring for fans & lights with 02 nos 5A switched socket & 2 nos 15 A switched socket in lighting board, incoming main switch, earthing, incoming power connection etc. complete(Light fittings & fans are reputed make only). Tentative detail as specified under and may varry as per site conditions..		
D.1.3a	Brickwork (230mm)	Cum	11.799
D.1.3c	Plaster 12mm thick	SQM	51.3
D.1.3d	Paint white wash	SQM	51.3
D.1.3e	RCC roof (M-20)- 1:1.5:3) cement supply in bidder scope	CUM	3.7125
D.1.3f	Shuttering	SQM	24.75
D.1.3g	Supply and Laying of Reiforcement Steel Fe500	MT	0.408375
D.1.3h	Steel -Flush door	Nos.	1
D.1.3i	Window	No.s	1
D.1.3j	Ventilators	No.s	2

S.No.	DESCRIPTION	UOM	QUANTITY
D.1.3k	Door window frame	Kg	50
D.1.3l	Lights, fans ,sockets. Ceiling fans, outside area lighting, MCB's and other electrical works for above control room including installation and charging.	Lumpsum	1
D.1.4	Supply and construction of RCC foundation as per scheme drawing for 11 kV VCBs/ RMUs. Approx size 3.0m x 1.5m x2.6m (LXBXH)-4 nos., 11kV /11.5 kV, 2.5 MVA Transformers-2 Nos. Approx size 3.5m x 3m x4m (LXBXH), from ground level and including excavation of plinth pit and base concreting and plastering, white washing etc. including construction of Fire Wall in between 2 Nos. 2.5 MVA transformer and oil soak pit as per IE stanard and as per detailed layout Drg. Tentative detail as specified under and may varry as per site conditions..		
D.1.4a	PCC for foundation for Transformers (02 Nos) + HT Breakers (04 Nos)-PCC M10 (1:3:6)-IS-456 : 2000	CUM	4.032
D.1.4b	RCC foundation for Transformers (02 Nos)+ HT Breakers (04 Nos)- -RCC M20 (1:1.5:3)-IS-456 : 2000	CUM	11.7
D.1.4c	Reinforcement Fe500 (TMT)	MT	1.287
D.1.4d	Shuttering	SQM	12.9
D.1.4e	Oil Soak Pit for 02 Nos Transformers (02 Nos) -Brickwork (2x2x1.0) pit wit 230mm B/w	CUM	1.84
D.1.4f	Brick Firewall between the transformers. -Brickwork 3wx3h wall with 230mm thick b/w	CUM	2.07
D.1.4g	Plastering the brick work (pit + firewall) 12mm thick plaster in 1:4	SQM	23.38
D.1.4h	Paint white wash	SQM	19.38
D.1.5	Supply and fixing of 3.15mm GI chain linked wire fencing height 2.5m for the substation. Grouting of 3m height ISA 75 fabricated posts at an interval of 1.5m (2m vertical 0.5m slanting, 0.5m grouting). 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 by 8SWG wire and providing finish aluminum painting of all steel materials etc. (Earthing flat supply and erection is paid separately).	Meters	60

S.No.	DESCRIPTION	UOM	QUANTITY
D.1.6	Supply and installation of 1m x 2.5m height MS gate made of MS Angle, channel/rolled sections including supply and fixing of hinges, locking arrangement etc including providing finish aluminum painting etc. (Per Sub Station)	Nos.	1
D.1.7	Supply and installation of One No. vertical air terminations, 6m height 50 mm NB 3.6mm thick medium class GI Pipe with 1m height lightning spike on the top (total height-7m) with suitable Base plate &foundation bolts for Ligtning protection of PSS. Vertical air terminal shall be grounded with earth pits. Required civil works for lightning pole erection and grouting including supply of grouting civil materials are in the scope of Contractor. (02 sets Per Sub Station)	Sets	2
D.2	**For Package Substation (PSS) Related Civil Works**		
D.2	Leveling of substation yard, supply and spreading of 40mm size stone aggregate of 75mm thick for an area of size 8m x 6m, supply and construction of Brick work with cement mortar 1:6 of 230 mm thick and 450 mm height all-round the substation yard, plastering the brick work in CM 1:6, white washing etc complete. (Per Sub Station). Tentative detail as specified under and may varry as per site conditions..		
D.2a	Excavation (8x6x0.300) -Eartwork	CUM	158.4
D.2b	**VOID**		
D.2c	Brickwork (8x2+6x2)x0.230	CUM	27.52134
D.2d	PCC M10 (1:3:6)	CUM	52.8
D.2e	Plastering the brick work 12mm thk	SQM	138.6
D.2f	Paint white wash	SQM	138.6
D.3	Supply and construction of foundation as per supplier foundation drawing for 500kVA/250kVA. Package Substation. Appx size 4400 mm x 4400 mm x500 mm height (size may slightly vary as per new order of PSS) from ground level and including excavation of plinth pit and base concreting and plastering, white washing etc. as per the instruction of BHEL site engineer. (Per Sub Station). Tentative detail as specified under and may varry as per site conditions..		
D.3a	RCC M20 (1:1.5:3)	CUM	106.48

S.No.	DESCRIPTION	UOM	QUANTITY
D.3b	Reiforcement	MT	11.7128
D.3c	Shuttering	SQM	96.8
D.4	Supply and fixing of 3.15mm GI chain linked wire fencing height 2.5m for the substation of size 8m x 6m including grouting of 3m height ISA 75 fabricated posts at an interval of 1.5m (2.5m 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 by 8 SWG GI wire and providing finish aluminum painting of all steel materials etc. Supplied structural steel materials are used for fencing posts. (Per Sub Station) (Earthing flat supply and erection is paid separately).	Meters	308
D.5	Supply and installation of 1m x 2.5m height MS gate made of MS Angle, channel/rolled sections including supply and fixing of hinges, locking arrangement etc including providing finish aluminum painting etc. (Per Sub Station)	Nos.	11
D.6	Supply and Erection of 3m long 50mm dia 3.6 mm thick medium class GI funnel type earth electrode with filling of bentonite earthing powder as per standard, four side brick work chamber with cement plastering, white washing and removable type RCC/ cast iron cover plate. Scope includes supply of required betonite eathing powder, cement, brick, sand, RCC/cast iron cover plate. Minium 06 earthpits per sub station. Sub station earthing shall be carried out by using supplied 50X6, 25X6 and 25x3 mm earth flats. (Supply and Eerection rates of Earth Flats are provided separately)	Nos.	66
D.7	Supply and erection One No. 5m height 3mm thick conical GI street light pole of reputed make with 40W LED street light fitting with base plate, foundation bolts and single lighting GI arm bracket with fasteners including suplly all civil materials like cement, metal & sand etc for making foundation and cabling from LT panel. Supply and providing of necessary timer circuit for auto charging of lights. Make shall be approved by BHEL/ Engineer	Nos.	22

S.No.	DESCRIPTION	UOM	QUANTITY
D.8	Supply and installation of One No. vertical air terminations, 6m height 50 mm NB 3.6mm thick medium class GI Pipe with 1m height lightning spike on the top (total height-7m) with suitable Base plate & foundation bolts for Ligtning protection of PSS. Vertical air terminal shall be grounded with earth pits. Required civil works for lightning pole erection and grouting including supply of grouting civil materials are in the scope of Contractor. (02 sets Per Sub Station)	Sets	22
D.9	Supply and Erection of 3m long 50mm dia 3.6 mm thick medium class GI funnel type earth electrode with filling of bentonite earthing powder as per standard, four side brick work chamber with cement plastering, white washing and removable type RCC/ cast iron cover plate. Scope includes supply of required betonite eathing powder, cement, brick, sand, RCC/cast iron cover plate. Minium 02 earthpits per LDB. Earthing shall be carried out by using supplied 50x6 and 25x3 mm earth flats. (Supply and Eerection rates of Earth Flats are provided separately)	Nos.	14
D.10	Excavation of cable trench size 0.4x1.0 m depth in all soil for HT cable and 0.4x0.8 m depth for LT cable. After cable laying, the trench will be back filled with excavated earth materials / other outside earth materials with compaction.	CUM	1240
D.11	Supply & Erection and spreading of river sand in cable trench of 300 mm thick for protection of HT Power cable.	CUM	180
D.12	Supply and laying of red/ ash bricks in the cable trench for protection of HT Power cable.	Nos	15000
Bill of Quantities for Package B:			
Operation and Maintenance of Construction Power Supply Network, Yard Lighting, Area Lighting for the Project Site			

S.No.	DESCRIPTION	UOM	QUANTITY
1	Operation and running maintenance including attending breakdown jobs for the entire Construction Power Network, Yard Lighting and Area lighting by providing required Manpower of skilled electricians , Helpers and supervisors with required T& Ps. Manpower strength shall be decided by BHEL site as per site requirement. Manpower shall be provided for 24 X 7 (including sundays and holidays) on shift basis. Shift hours minimum 8 hrs per day. The contract period for Operation and Maintenance will start as defined in the Technical Conditions of Contract. The scope also includes High Masts, BHEL Offices, BHEL Stores, etc.		
1.1	Electricians	Man Months	117
1.2	Helpers	Man Months	187
1.3	Supervisors	Man Months	39

1.9.2 NOTE:

i. Before quoting in the Price bid, the bidder shall go through the detailed specification of all items of BOQ as well as Scope of Work as specified in relevant Clause of this document.

ii. The quantity indicated in the BOQ / Price bid is approximate only and is liable for variation. Payment will be as per actual quantity erected / commissioned as certified by BHEL Engineer.

VOLUME IA PART I CHAPTER X

GENERAL

The scope of the work will comprise of but not limited to the following:
(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

1.10.1. Successful Bidder is requested to furnish the following at PSSR-HQ Chennai immediately after release of Letter of Intent (LOI)

- Security Deposit
- Unqualified Acceptance for LOI, Detailed LOI / Work Order.
- Rs.160/- Stamp Paper for preparation of Contract Agreement.

1.10.2. Successful Bidder is requested to furnish the proof of documents for the following at the respective PSSR- Site

1. PF Regn No.
2. Labour License No.
3. Workmen Insurance Policy No.

1.10.3. In addition to the clause 2.8 of General Conditions of Contract (Volume-1C of Book-II) the contractor shall comply with the following.

1.10.4. PROVIDENT FUND

1.10.4.1. 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 the 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.

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

1.10.5. OTHER STATUTORY REQUIREMENTS

1.10.5.1. The Contractor shall submit a copy of Labour License obtained from the Licensing Officer (Form VI) u/r25 read with u/s 12 of Contract Labour (R&A) Act 1970 & rules and Valid WC Insurance copy or ESI Code (if applicable) and PF code no. along with the first running bill.

1.10.5.2. 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.

1.10.5.3. 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 contractor, BHEL will reserve its right to pay the workmen under the orders of Appropriate authority at the risk and cost of the Contractor.

1.10.5.4. The Contractor shall submit copies of Final Settlement statement of disbursal of retrenchment benefits on retrenchment of each workmen under I D Act 1948, copies of Form 6-A (Annual Return of PF Contribution) along with copies of PF Contribution Card of each member under PF Act and copies of monthly return on ESI Contribution – Form 6 under ESI Act 1948 (if applicable) to BHEL along with the Final Bill.

1.10.5.5. In case of any dispute pending before the appropriate authority under ID 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.

1.10.5.6. 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

1.10.6. DEPLOYMENT OF SKILLED / SEMI-SKILLED TRADESMEN

The following clause is applicable in case the contract value / contract price is Rs. Five crores and above.

The contractor shall, at all stages of work deploy skilled / semi-skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute / Industrial Training. Institute / National Institute of Construction Management and Research (NICMAR), National Academy of Construction, CIDC or any similar reputed and recognized Institute managed / certified by State / Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled / semi-skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in- Charge. Failure on the part of contractor to obtain approval of Engineer-in- Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 160 per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding

1.10.7. Site Visit by the Bidder

1.10.7.1 The bidder shall, prior to submitting his tender for the work, visit, examine and acquire full knowledge & information and necessary conditions prevailing at the site and its surroundings of the plant premises together with all statutory, obligatory, mandatory requirements of various authorities about the site of works at his own expense, and obtain and ascertain for himself on his own responsibility that may be for preparing his tender and entering into a contract, and take the same into account in the quoted contract price for the work.

1.10.7.2 The bidder shall satisfy themselves about the following factors:

i). Site conditions including access to the site, existing and required roads and other means of transport/communication for use by him in connection with the work including diverting and re-routing of services.

ii). Requirement and availability of land and other facilities of his enabling works, establishment of his nursery, office, stores etc.

iii). Ground conditions including those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained there-from.

iv). Source and extent of availability of suitable materials, including water etc., and labour (skilled and unskilled) required for work, and laws and regulations governing their use and employment.

v). Geological, meteorological, topographical and other general features of the site and its surroundings as are pertaining to and needed for the performance of the work.

vi). The limit and extent of surface and subsurface water to be encountered during the performance of the work, and the requirement of drainage and pumping.

vii). The type of equipment and facilities needed, for and in the performance of the work;

viii). The extent of lead and lift required for the work in complete form over the entire duration of the contract, and

ix). All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.

1.10.7.3 The bidder should note that information, if any, in regard to the local conditions, as contained in these tender documents, has been given to tenderer merely for guidance and is not warranted to be complete.

1.10.7.4 A bidder shall be deemed to have full knowledge of the site, whether he inspects it or not, and no extra charges consequent on any misunderstanding or otherwise shall be allowed.

1.10.7.5 The bidder and any of his personnel or agents will be granted permission by the Site-In-Charge or his authorized nominee, on receipt of formal application in respect thereof a week in advance of the proposed date of inspection of site, to enter upon his premises and lands for purpose of such inspection, but only on the express condition that the tenderer (and his personnel and agents) will relieve and indemnify the Employer (and his personnel and agents) from and against all liability in respect thereof and will be responsible for personal injury (whether fatal or otherwise), loss of or damage to property and any other loss, damage, costs and expenses however caused which, but for the exercise of such permission, would

not have arisen.

1.10.7.8 The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his rolls adequately trained, qualified and experienced supervisory staff and skilled personnel.

1.10.7.9 It is not the intent to specify herein all details of all material. Any item related this work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the work.

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

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

1.10.7.12 The contractor shall carry out additional tests, if any, which the Engineer feels necessary because of site conditions and also to meet system specification.

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

1.10.7.14 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.

1.10.7.15 Wherever Construction sequences are furnished by BHEL, the contractor shall follow the same sequence. Contractor shall execute the supply and works as per sequence prescribed by BHEL at site engineer. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of execution of similar job in any other site or for any reasons whatsoever.

1.10.7.16 If required by BHEL, the contractor shall change the sequence of his operation so that work on priority sectors can be completed within the projects schedule. The contractor shall afford maximum assistance to BHEL in this connection without causing delay to agreed completion date.

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

1.10.7.18 Contractor shall retain all T&P / Testing instrument / Material handling equipment’s etc. at site as per advice of BHEL engineer and same shall be taken out from site only after

getting the clearances from engineer in charge.

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

1.10.7.20 The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances. However, completion time for construction, agreed will be subject to the condition that contractor's work is not hampered by the agencies.

1.10.7.21 Contractor has to work in close co-ordination with other agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less / more at a particular given time. Activities and Construction program have to be planned in such a way that the milestones are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.

1.10.7.22 The contractor must obtain the signature and permission of the security personnel of the customer / BHEL 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. Surplus materials including steel item brought at site by the contractors with proper documentation and Gate pass, shall be allowed to taken out of the project premises after completion of relevant works, on certification by BHEL in charge.

1.10.7.23 Contractor shall remove all scrap materials periodically generated from his working area and collect the same at one place earmarked for the same. Load of scraps is to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect.

1.10.7.24 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.

1.10.7.25 The contractor is strictly prohibited from using BHEL's regular components like angles, channels, beams, plates, pipe / tubes, and handrails etc. for any temporary supporting or scaffolding works. Contractor shall arrange himself all such materials. In case of such misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor.

1.10.7.26 No member of the already erected structure / buildings, other component and auxiliaries should be removed / modified without specific approval of BHEL engineer.

1.10.7.27 Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on latest ISO 9001

Standards.

1.10.7.28 Sometimes, it may be required to re-schedule the activities to enable other agencies to commence/ continue the work so as to keep the overall project schedule.

1.10.7.29 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.

1.10.7.30 Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.

1.10.7.31 On Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

1.10.7.32 It is the responsibility of the contractor to do the checking, testing etc. if necessary, repeatedly to satisfy BHEL Engineer with all the necessary tools and tackles, manpower etc. without any extra cost. The testing will be completed only when jointly certified so, by the BHEL Engineer.

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

1.10.7.34 The contractor's work shall not hinder other work, either underground or over ground, such as electrical, phone lines, water or sewage lines, etc. In areas of overlap, the contractor shall work in coordination with other related contractors. Any damage by the landscape contractor's team to such utilities will be penalized and contractor shall be responsible for cost for such damages.

1.10.7.35 The contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be effected for such excess drawls at the rate prescribed by manufacturing units.

1.10.7.36 Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer for other agencies, like Boiler, piping, Turbine, Generator erection, Cabling, instrumentation, insulation etc., to commence their work from / on the equipments coming under this scope.For the purpose of planning, contractor shall furnish the estimated requirement of Power (month wise) for execution of work in terms of maximum KW demand.

1.10.8. RECORDS TO BE MAINTAINED AT SITE:

Record of Quantity of FREE/Chargeable items issued by BHEL must be maintained during contract execution. Also reconciliation statement to be prepared at regular intervals.

The under mentioned Records/ Log-books/ Registers applicable to be maintained.

(i) Hindrance Register

(ii) Site Order Book.

(iii) Test Check of measurements.

(iv) Steel & Cement Supply and Consumption Daily Register

(v) Records of Test reports of Field tests.

(vi) Records of manufacture's test certificates.
Records of disposal of scraps generated during and after the work completion

1.10.9. GENERAL

1.10.9.1. Identification of equipment at storage yard, technical assistance for checking and making the shortage/damage reports, taking delivery at storage yard and pre-assembly of equipment wherever required, erecting the equipment, aligning, fastening, supporting, cleaning, checking and carrying out statutory tests as required, trial operation, pre-commissioning, commissioning and post-commissioning activities up to the time of completion of commissioning activities using their tools and tackles and testing instruments along with the supply of all consumables.

1.10.9.2. Scope of work covered under this specification requires quality workmanship, engineering and construction management. The contractor shall ensure timely completion of work. The contractor shall have adequate tools, measuring instruments, calibrating equipment etc. in his possession. He shall also have adequate trained, qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works.

1.10.9.3. It is not the intent to specify herein all details of material. Any item related this work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the work.

1.10.9.4. The contractor shall have valid ELECTRICAL CONTRACTOR LICENSE, as required to carry out the scope / job mentioned in the Bill of Quantity (BOQ) as on date of commencement of work.

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

1.10.9.6. The contractor shall carry out testing, pre-commissioning, commissioning and trial run of the connected equipment under overall guidance of BHEL and shall locate any cause of malfunction and rectify the same for proper operation. Testing shall also include any

additional tests, which the Engineer feels necessary because of site conditions and also to meet system specification.

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

1.10.9.8. 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.

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

1.10.9.10. During the course of erection, testing and commissioning of electrical work, certain rework / modification / rectification / repairs / fabrication etc. may be necessary on account of feed back from other power stations and site operation / maintenance requirements. Contractor shall carryout such rework / modification / rectification / fabrication / repairs etc, promptly and expeditiously.

1.10.9.11. The contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be effected for such excess drawals at the rate prescribed by BHEL Engineer.

1.10.9.12. 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.

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

1.10.9.14. The contractor must obtain the signature and permission of the security personnel of the customer, if required for bringing any of their materials inside the site premises. Without the Entry Gate Pass these materials, T&Ps, etc will not be allowed to be taken outside.

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

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

1.10.9.17. Wherever erection sequences are furnished by BHEL, the contractor shall follow the same sequence. If required by BHEL, the contractor shall change the sequence of his operation so that work on priority sectors can be completed within the projects schedule. The contractor shall afford maximum assistance to BHEL in this connection without causing delay to agreed completion date.

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

1.10.9.19. Contractor has to work in close co-ordination with other erection agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less / more at a particular given time. Activities and erection program have to be planned in such a way that the milestones are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.

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

1.10.9.21. The contractor is strictly prohibited from using BHEL's regular components like angles, channels, beams, plates, pipe / tubes, and handrails etc for any temporary supporting or scaffolding works. Contractor shall arrange himself all such materials. In case of such misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor.

1.10.9.22. No member of the already erected structure / platform, pipes, grills, platform, other component and auxiliaries should be cut without specific approval of BHEL engineer.

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

1.10.9.24. For other agencies, such as piping, Boiler, ESP, instrumentation, insulaton etc., to commence their work from / on the equipment coming under this scope, Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer. Some time it may be required to re-schedule the activities to enable other agencies to commence/continue the work so as to keep the over all project schedule.

1.10.9.25. The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.

1.10.9.26. Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.

1.10.9.27. On Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

1.10.9.28. Prior to erection of any components inspection to be done for any foreign materials and damages and they are to be attended as per directions of BHEL engineer.

1.10.9.29. It is the responsibility of the contractor to do the alignment, checking, etc. if necessary, repeatedly to satisfy BHEL Engineer / Customer Engineers with all the necessary tools and tackles, manpower etc. without any extra cost. The alignment will be completed only when jointly certified so, by the BHEL Engineer & Customer. Also the contractor should ensure that the alignment is not disturbed afterwards.

1.10.9.30. If any item or equipment not covered but requires being erected/commissioned, same shall be carried out by the contractor. Equivalent or proportional unit rate shall be considered wherever possible from the BOQ.

1.10.9.31. 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.

1.10.9.32. 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.

1.10.9.33. 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.

1.10.9.34. All the necessary certificates and licenses required to carry out this scope of work are to be arranged by the contractor then and there at no extra cost. Also, refer clause - ELECTRICAL INSPECTORATE'S APPROVAL given below:

1.10.9.35. **ELECTRICAL INSPECTORATE'S APPROVAL:**

a. Also refer clause 1.13.1 of chapter XIII in Technical Conditions of Contract, Volume I Book I for approval of Electrical drawings.

b. The contractor shall arrange necessary statutory inspections and obtain certificates for the installation work at his cost. Contractor is responsible for getting Electrical

Inspector / statutory authority's approval for all electrical installation covered in his scope.

c. All electrical installation covered in contractors scope is to be inspected / approved by the electrical inspector / statutory authority. For getting electrical inspector approval, contractor shall arrange the following:

   i. Work Completion certificate for all the equipment covered in the contract.
   ii. Details of Equipments (specification)
   iii. Copy of Test results conducted at site for all the equipment.
   iv. Any other documents as required by statutory authority. Any expenditure related to documentation shall be borne by contractor.
   v. Contractor shall carry out the modifications / rectifications if any as suggested by the authority at his cost.
   vi. Contractor shall also have valid electrical installation license on his company as well as for individuals acceptable to respective state electrical inspectorate requirement.
   vii. Any modification work required by inspector shall be attended by the contractor.

1.10.9.36. **SITE INSPECTION**

a. The owner / employer or his authorized agents may inspect various stages of work during the currency of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the owner / employer without any extra cost to the owner / employer. No cost whatsoever such duplication of inspection of work be entertained.

b. BHEL / Customer will have full power and authority to inspect the works at any time, either on the site or at the contractor's premises. The contractor shall arrange every facility and assistance to carry out such inspection. On no account will the contractor be allowed to proceed with work of any type unless such work has been inspected and entries are made in the site inspection register by customer / BHEL.

c. Wherever the performance of work by the contractor is not satisfactory in respect of workmanship, deployment of sufficient labour or equipment, delay in execution of work or any other matter, BHEL shall have the right to engage labour at normal ruling rates and get the work executed through other agency and debit the cost to the contractor and the contractor shall have no right to claim compensation thereof. In

such a case, BHEL shall have the right to utilize the materials and tools brought by the contractors for the same work.

1.10.9.37. **MANPOWER REQUIREMENT**

a. The contractor shall provide to the satisfaction of BHEL, sufficient and qualified staff for the execution of works. If and whenever any of the contractor's staff is found guilty of any misconduct or be incompetent or insufficiently qualified in the performance of his duties the contractor shall remove them from site as directed by Site Engineer.

b. Supervisor should have a minimum qualification of Diploma in Engineering or any graduate with minimum 05 years of experience in Thermal Power Station. Electrician should be a certified Electrician from the respective state statutory body.

c. Safety Engineers should have experience in construction field especially in power plant.

d. The Site in charge shall be provided with PCs and good communication facilities like telephone, fax, email etc. at the cost and expense of the contractor. Lack of communication facilities will not be an excuse for extension of completion date.

e. All instructions from BHEL / Customer will be directed to the contractor through the Site in-charge and he shall be responsible for all the contractor's activities at site. The contractor shall name his authorized representative prior to or immediately on commencement of operations at site

f. The Site In charge shall be present at site during all normal working hours and his contact address after normal working hours shall be made available to BHEL so that if any emergency arises, the presence of the contractor's site Representative at site can be called for.

g. The contractor shall not change the site Representative without the consent of BHEL. Should BHEL require the replacement of the contractor's site Representative for justifiable reasons (including inadequate progress of work) the contractor shall ensure that replacement is made as soon as possible and work is not allowed suffering delay on this account.

h. The contractor shall ensure that all his supervisor's staff and workmen conduct themselves in a proper manner. They shall all be persons who are familiar with and skilled at the jobs allocated to them. Any misconduct / inefficiency noted on the part of the contractor's personnel shall be brought to the attention of the contractor's site representative who shall immediately take such action as necessary including the

removal of such misconducting / inefficient persons, if so required by the Engineer-in-Charge.

1.10.9.38. **DOCUMENTATION**

a. The following information shall be furnished by the bidder within two weeks of award of contract for purchaser's approval
   i. Bar chart covering planned activities at site
   ii. Detailed organization chart
   iii. Details of T&P available with contractors with documents proofs.

b. The following information shall be furnished by the bidder after testing and inspection:
   i. Test certificates of various tests conducted at site. All inspection and test certificates shall be signed by customer's representative also, wherever called for as per field quality plan.

c. As built drawings: After successful completion, testing and commissioning of installation work, Purchaser's drawings / documents shall be updated in line with the actual work carried out and as built drawings / documents shall be submitted by the contractor as agreed for the project

VOLUME IA PART I CHAPTER XI
FOUNDATIONS AND GROUTING

The scope of the work will comprise of but not limited to the following.

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified)

1.11.1. Foundation for the equipments to be erected shall be in scope of the contractor. For further details and specific exclusions, please refer Volume1A, Part-1, Chapter-IX, BOQ and Volume-1A, Part-1, Chapter-II Scope of Works.

1.11.2. Cleaning of foundation surfaces, pocket holes and anchor bolt pits etc., dewatering, making them free of oil, grease, sand and other foreign materials by soda wash, water wash, compressed air or any other approved methods etc., form/shuttering work are within the scope this work.

1.11.3. The surface of foundations shall be dressed to bring the surface of the foundations to the required level and smoothness prior to placement of equipment.

1.11.4. Foundation pockets are to be cleaned thoroughly before placing the columns/equipment. Verticality of foundation bolts to be checked along with correctness of the threads and freeness of the nuts movement. If required cleaning of the threads to be done with proper dies.

1.11.5. The concrete foundation, surfaces shall be properly prepared by chipping, as required to bring the top of such foundation to the required level to provide the necessary roughness for bondage and to ensure enough bearing strength. All laitance and surface film shall be removed and cleaned. The required percentage contact between contact surfaces of Packer plates and foundation shall be achieved by chipping and scrapping as per BHEL Engineers instructions.

1.11.6. For grouting of equipment necessary cement, sand, gravels, etc., to be arranged by the contractor including the fine aggregates

1.11.7. PROCEDURE FOR GROUTING: Contractor has to carry out the grouting as per the work instructions for grouting available at site.

VOLUME IA PART I CHAPTER XII
MATERIAL HANDLING, TRANSPORTATION AND SITE STORAGE

The scope of the work will comprise of but not limited to the following:
(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

1.12.1. SCOPE OF STORAGE/TRANSPORT OF CONTRACTOR SUPPLIED ITEMS

1.12.1.1. Contractor shall also make his own arrangement for transporting the 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.

1.12.1.2. Any excess materials supplied for which payment has not been made can be taken back by the contractor as per customer procedure. Incoming material gate pass shall be made for any material supplied by the contractor.

1.12.1.3. Contractor shall unload, transport, store, erect, test and commission the equipment as per instructions of the manufacturer recommendation.

1.12.1.4. Contractor shall be responsible for examining all the shipment immediately for any damage, shortage, discrepancy etc. for the purpose of Purchaser's information only. However, once the material is received by the contractor, the Contractor shall be solely responsible for any shortages or damages in transit, handling and/or in storage and erection of the equipment at Site. Also the contractor is fully responsible for the materials supplied by him.

1.12.2. COLLECTION OF BHEL SCOPE OF SUPPLY MATERIALS

1.12.2.1. Contractor shall take delivery of BHEL supplied materials from the stores / storage yard / sheds of BHEL / customer, after getting approval of engineer / customer in the prescribed indent forms of BHEL / customer. 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 transport 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.

1.12.2.2. Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment, placement on respective foundation / location, fabrication yard, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipment from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks / slings / tools and tackles / labour including operators Fuel lubricants etc for loading & unloading of materials will be in the scope of contractor.

1.12.2.3. BHEL shall issue materials covered in BHEL scope from their stores at site. The contractor shall collect such materials from BHEL stores and transport to site of work at his cost.

1.12.2.4. The equipment / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.

1.12.2.5. The contractor shall inspect such materials as soon as received by the contractor and shall bring to the attention of the Engineer-in-Charge any shortage / damage or other defects noticed before taking over the materials. Materials once taken over will be deemed to have been received in good condition and in correct quantities except for intrinsic defects which cannot be observed by visual and dimensional inspection and weighing.

1.12.2.6. Upon receipt by the contractor, the responsibility for any loss, damage and / or misuse of such materials shall rest with the contractor.

1.12.2.7. All materials issued by BHEL shall be properly stored and systematic records of receipts, issue and disposal will be maintained. Periodic inventory shall be made available to BHEL Engineer-in-Charge.

1.12.2.8. All materials issued by BHEL shall be utilized as directed by Engineer-in Charge or most economically in the absence of such direction. The contractor shall be responsible for the return to BHEL Stores of all surplus material, as determined by the Engineer-in-Charge.

1.12.2.9. If the materials issued by BHEL are lost, damaged or unaccounted, the cost of such items shall be recovered from payments to the contractor. However, the contractor shall raise FIR and inform BHEL all details.

1.12.2.10. Sometimes it may become necessary for the contractor to handle certain unrequired components at Customer's / BHEL's stores 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.

1.12.3. STORAGE

1.12.3.1. The contractor shall provide any fixtures, concrete blocks & wooden sleepers, which are required for temporary supporting / storage of the components at site.

1.12.3.2. The equipment should be preferably in its original package and should not be unpacked until it absolutely necessary for its installation. The equipment should be best protected in its cases. It should be arranged away from walls.

1.12.3.3. The wooden pallet provided for packing itself can be retained for raised platform to protect equipment from ground damps, sinking into around and to circulate air under the stored equipment. This will also help in lifting the packing with fork lift truck.

1.12.3.4. Periodic inspection of silica gel placed inside the equipment is necessary. It has to be replaced when decolorization takes place or regenerated. BHEL shall supply the material and contractor shall replace for BHEL provided equipment.

1.12.3.5. Due care should be taken to ensure that the equipment is not exposed to fumes gases etc. which can affect electrical contacts of relays and terminal boards.

1.12.3.6. The storage room and the equipment should be checked at regular interval of three months to ensure protection from termites, mould growth, condensation of water etc. which can

damage the equipment. Contractor shall keep BHEL informed about such problem and try to rectify the problem at his cost.

1.12.3.7. All the instrument, materials and goods kept in the store room should be identified and registered in a book. Inspection report should be recorded. Any discrepancy observed should be communicated to site.

1.12.3.8. The loose items supplied for the main equipment falls into various categories like tools, modules, prefabricated cables, console inserts, recorders, modules and display units, printers, sensors and transducers, PCs, monitors, cable glands, cable ducts, frames etc. are to be categorized and stored separately.

1.12.4. Sub-Assemblies

1.12.4.1. All sub-assemblies should be kept in a separate place where it is easily accessible.

1.12.4.2. Sub-assemblies should have a protective cover in case it is stored without wooden packing / case to prevent accumulation of dust. Silica gel packets should also be kept along with it.

1.12.4.3. Sub-assemblies should not be stacked one above the other.

1.12.5. Materials shall be stacked neatly, preserved and stored in the contractor's shed / work area in an orderly manner. In case it is necessary to shift and restack the materials kept at work area / site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost

1.12.6. Sometimes it may become necessary for the contractor to handle certain unrequired components at Customer's / BHEL's stores 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.

1.12.7. The contractor shall provide any fixtures, concrete blocks & wooden sleepers, which are required for temporary supporting / storage of the components at site.

1.12.8. Contractor has to arrange required fire-resistant tarpaulins to protect the machined components / assembled parts drawn from BHEL, before and after erection at their cost.

1.12.9. The contractor shall take delivery of item, materials and consumables from the storage yard / stores / sheds of BHEL / customer, after getting approval of engineer / customer in the prescribed indent forms of BHEL / customer. He shall also make arrangements for safe custody, watch and ward of equipment after it has been handed over to them till they are fully erected, tested and commissioned.

1.12.10. The equipment / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.

VOLUME IA PART I CHAPTER XIII
SCOPE OF SUPPLY AND ERECTION DETAILED

1.13.1. SCOPE OF ROUTE SURVEY LAYOUT AND DETAILED DRAWINGS

1.13.1.1. The drawings provided along with the tender are only schematic, typical and tentative. The contractor shall prepare final detailed drawings in consultation with site engineers after carrying out the route survey for underground distribution. 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 drawings, contractor shall procure/ fabricate, install all construction power supply equipment as required and erect as per drawing. After CEIG/CEA, if any modification/correction is required in line with applicable IE standards the same has to be done by the contractor.

1.13.2. SCOPE OF SUPPLY

1.13.2.1. Scope of supply of materials shall be as detailed in the BOQ. All materials shall be procured from reputed manufacturers as per IS specification. Bidder shall ensure technical compliance for supply and erection to ensure trouble-free operation. Necessary test certificates, guarantee certificate etc. shall be submitted to BHEL along with supply.

1.13.2.2. The quantities furnished in the BOQ for supply items are approximate only. Contractor shall assess the quantity of supply items jointly with BHEL engineer after conducting route survey, which is part of this contract and also taking in to consideration the materials supplied by BHEL. If suitable materials are available with BHEL, the quantity of supply items shall be reduced accordingly. The payment for erection of BHEL supply items shall be as per rate quoted for erection.

1.13.2.3. The quantity to be supplied shall be strictly as per site requirement only in consultation with BHEL Engineer-in-Charge. Contractor shall submit the relevant specification, Make and qty of materials being supplied before ordering the items on the sub suppliers. Any poor/Inferior quality materials and supplied without BHEL engineer's concurrence shall be rejected. 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 Store Receipt Voucher (SRV) shall be submitted. After BHEL verification, material shall be kept under contractor's custody.

1.13.3. SCOPE OF ERECTION

The scope of construction power supply, area lighting, yard lighting work will comprise but not limited to the following:

1.13.3.1. The scope of "Construction Power Supply Package" work includes engineering, procurement, 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 equipment erected as per the tender specifications using their tools and tackles and testing instruments along with the supply of all consumables.

1.13.3.2. 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.

1.13.3.3. The scope of specification covers the installation, testing and commissioning of the erected equipment / instrument along with accessories as detailed in Bill of Quantity.

1.13.3.4. 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.

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

1.13.3.6. Contractor shall erect all items, equipment etc. as per sequence prescribed by BHEL at site. BHEL engineer depending upon the availability of materials at site will decide the priority of erection requirements & 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.

1.13.3.7. 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 site 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.

1.13.3.8. The bidder has to arrange on his own, Lighting required for his erection purpose.

1.13.3.9. Removal of rank vegetation, grass, brushwood, etc. (if any), backfilling & levelling of ground required for execution of work within the scope of this contract shall be deemed to be part of the scope of work.

1.13.3.10. **SCOPE OF 500 KVA, 11KV/433 V SUB –STATIONS**

1.13.3.10.1. **SKID mounted mobile type substations**

1. Scope of BHEL supply items for each SKID mounted mobile type Substation as free issue shall be as below:
   a. 11 KV/433 V- 500 KVA Skid mounted mobile Substation.
      i. Each substation shall have approximate size of (L)2800 X (B)2430 X (H) 2350 and weight 05 MT.
      ii. This substation shall be a single unit consisting 11 KV VCB, Dry Type 500 KVA Transformer, LT Board with all protection circuits.
2. Contractor scope of work for each Skid mounted mobile type substations.

a. Preparation of details drawing of 11KV/433 V substation layout
b. Vetting of drawings & documents by BHEL.
c. Supply and installation Earth Pits
d. Supply and installation lightning poles and spikes
e. Supply and Installation of Earthing materials as required for Substation
f. Supply and installation of Lighting Poles, fixtures, hardware and its DB's-
g. Supply installation of safety boards
h. Installation of BHEL supplied free issue materials as mentioned under above clause.
i. All civil works like arranging Block foundation of suitable size, fencing & gate and supply of required materials for civil works, including Supply and installation of fencing & gate etc as detailed in the technical requirement Clause.
j. Obtaining approval of entire installation from appropriate statutory authority
k. Supply and Installation of HT termination kits.
l. Commissioning of Substations
m. Rate for the above works for 11 KV/433V Skid mounted mobile type substations will be governed by the relevant Rate Schedule items.

1.13.3.11. **SCOPE OF SUB STATION YARD/BHEL INCOMING POWER RECEIVING STATION LEVELING AND FENCING**

1.13.3.11.1. After conducting route survey and identifying the location, the yard shall be leveled suitably. Necessary, PCC pavement, fencing, shall be carried out by the contractor. Construction of foundation for kiosks and Transformer, plinth wall, etc, if applicable shall be carried out by the contractor.

1.13.3.11.2. The supply of materials required for the above civil works shall be arranged by the contractor. Above works shall be carried out as per priority decided by site Engineers and the works shall be as per Indian electricity rules & regulation.

1.13.3.12. **SCOPE OF ERECTION OF L.T. KIOSK & 11 KV CB (HT KIOSK)**

1.13.3.12.1. LT Kiosk supplied by BHEL, 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 LT Kiosk as part of Kiosk erection.

1.13.3.12.2. If any loose items supplied along with LT Kiosks are required to be mounted, the same shall be carried out by the contractor at free of charge.

1.13.3.12.3. Kiosk shall be checked up thoroughly and if any items are found to be damaged / defective / not working and requires replacement or any internal wiring to be modified, the same shall be carried out by the contractor at the free of cost. However, replacement materials shall be arranged by BHEL.

1.13.3.12.4. Erection of LT Kiosks shall cover all the works mentioned above including full painting. The base frames shall normally be supplied along with the kiosks. These shall be aligned, leveled and grouted in position, as per approved drawings. Wherever the base channels are not available, the same shall be fabricated and painted by the contractor within the quoted rate. However, required steel materials shall be arranged by the contractor as part of steel supply item. Base channels shall be grouted on the foundation.

1.13.3.12.5. 11 KV CB (HT KIOSK) shall be erected in line with LT Kiosk

1.13.3.12.6. Contractor shall carry out full painting for LT Kiosks and 11 KV CB (HT KIOSK), as applicable.

1.13.3.12.7. LT Kiosk and 11 KV outdoor/indoor CB (HT KIOSK) shall be checked thoroughly and before charging, contractor shall carry out checking of Breaker operation, FS unit operation, Bus bar clearances, earth resistance and protection checks etc. After the satisfactory completion of these checks, the LT Kiosk and 11 KV CB shall be energized. The contractor shall arrange all instruments required for testing at his cost.

1.13.3.12.8. **No separate unit rate shall be paid for the erection of HT/LT kiosk which shall be part of 11 KV/433 V sub station works.**

1.13.3.13. **SCOPE OF SUPPLY AND INSTALLATION OF SIGN BOARDS AND SAFETY MEASURES**

1.13.3.13.1. All required signboards, caution boards and safety boards shall be arranged and installed by the contractor in all poles and sub-stations wherever required. 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 equipment to his workmen to avoid accidents.

1.13.3.14. **SCOPE OF SKID MOUNTED MOBILE TYPE SUBSTATION**

1.13.3.14.1. Skid mounted mobile type substations will be supplied by BHEL. 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 Skid mounted mobile substations 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 Skid mounted mobile substations.

1.13.3.14.2. If any loose items supplied along with Skid mounted mobile substations that are required to be mounted, the same shall be carried out by the contractor at free of charge.

1.13.3.14.3. The base framed shall normally be supplied along with the Skid Mounted Sub Station. These shall be aligned, leveled and grouted in position, as per approved drawings. Wherever the base channels are not available, the same shall be fabricated and painting shall be carried out by the contractor. However, required materials shall be arranged by BHEL with the approval of Site In-charge/BHEL. Base channels shall be grouted on the foundation.

1.13.3.14.4. Skid mounted mobile substations shall be checked thoroughly and before charging. After the satisfactory completion of these checks, the LT Board and 11 KV CB shall be energized. The contractor shall arrange all instruments required for testing at his cost. Kiosk shall be checked up thoroughly and if any items are found to be damaged/ defective/ not working and requires replacement or any internal wiring to be modified, the same shall be carried out by the contractor at the free of cost. However, replacement materials shall be arranged by BHEL.

1.13.3.15. **SCOPE OF EARTHING, LIGHTING AND LIGHTNING PROTECTION SYSTEM**

1.13.3.15.1. The scope of earthing covers, earthing of all substation equipment, pillar box and providing earth pits as per IS requirement.

1.13.3.15.2. The scope of earth pits covers excavation, supply and erection of 3 Mtr. Long earth electrode, filling the pits with alternate layer of charcoal & salt / with Bentonite Earthing Powder as per IE specification, making of brick chamber with both side plastering supply and fixing of manhole cover plate with RCC slab, as per typical drawing provided by BHEL.

1.13.3.15.3. Number of earth pits for substation shall be decided considering soil resistivity.

1.13.3.15.4. LIGHTING: Scope of Lighting covers supply and installation of lighting poles with Fixtures, control gears and Luminaries. The pole shall be tubular type as per BOQ as per applicable standard. All the pole shall be supplied with associated pole mounted junction Boxes, suitable galvanized MS base plate wires etc. The scope of erection work shall include all civil works including supply of cement, sand, metal etc, mounting of assembled fittings, wiring/ cabling from junction box at the bottom of pole up to the lighting fixture,

1.13.3.15.5. LIGHTNING PROTECTION: The scope of work of Lightning Protection system includes supply and installation of two numbers vertical air terminations and poles of with base plate. The pole shall be tubular type as per applicable standard. Vertical air terminal shall be grounded with earth pits. Required civil works for lighting pole erection and grouting, grounding the air terminals and supply of grouting and

grounding materials are in the scope of Contractor. The supply of above base plate is in the scope of contractors.

1.13.3.16. **SCOPE OF SUPPLY AND ERECTION OF HT PILLAR BOX**

1.13.3.16.1. Scope of supply and erection of 11KV HT Pillar Box includes, fabrication and fixing of supports, supply and erection of earth pit, supply and erection of earthing materials, supply and of erection of 3 sets 3Cx185 sqmm HT Termination kits, including supply of safety boards. The erection works also covers associated civil works like making suitable foundation and supply of foundation materials as required Pillar box shall be checked thoroughly and before charging.

1.13.3.17. **SCOPE OF 11 KV FEEDER POWER DISTRIBUTION SYSTEM**

1. BHEL Scope of supply as free issue: Refer Chapter-II, Volume-IA in TCC
2. Contractor scope of work for 11 KV distribution
    a. Conducting route survey
    b. Preparation of distribution / drawing
    c. Vetting of drawings & documents by BHEL
    d. Installation of BHEL supplied free issued materials as mentioned under above clause
    e. Supply and installation of HT Termination and joining kits, Glands, lugs, etc.
    f. Supply and spreading of bricks
    g. Removal of rank vegetation, grass, brushwood of required.
    h. Excavation and refilling of earth
    i. Supply and installation cable markers.
    j. Unit rate shall be quoted on meter basis for cable laying inclusive of termination, as applicable.

1.13.3.18. **SCOPE OF LAYING AND TERMINATION OF H.T. AND L.T. CABLE**

1. Scope of BHEL supply cables as free issue: Refer Chapter-II, Volume-IA in TCC
2. All cables shall be drawn by the contractor from BHEL Stores.
3. Both supplying and laying of GI pipes shall be in the scope of contractor.
4. HT Cables shall be laid in below ground at a depth of 1200 mm. Before stating excavation, route survey shall be conducted in consultation with site engineers. Cable shall be laid through GI pipes/Hume pipes as protective cover wherever road crossings are there.
5. The cables thus drawn 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.

6. Cable laying and termination shall be in accordance with relevant IS-specification. The cables shall be suitably supported so that the cable load should not cause strain to the equipment connected.
7. 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 at free of cost and cable termination shall be carried out by using suitable cable glands etc as required.
8. Pillar Boxes shall be suitable installed..
9. 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 free of charges.
10. Wherever road crossings are there, cable shall be laid in suitable pipes to the depth as mentioned above/relevant IS standards. Excavation, laying of pipes and refilling of earth shall be part of cable laying.
11. Separate unit rate shall be paid for the Laying and termination of HT Cables
12. The cable glands and lugs mentioned in the BOQ shall be supplied by the contractor as per rates quoted. Supply of glands and lugs for the cables lesser than the size mentioned in the BOQ shall be in the scope of contractor including supply of cable glands, lugs, etc and installation of the same.

1.13.3.19. **DETAILED SCOPE OF WORKS AREA LIGHTING, YARD LIGHTING:**

1.13.3.19.1. **SWAGED LIGHTING POLES:**

1. Lighting poles shall be of stepped tubular / swaged type 9 metre long steel poles as per applicable standard and as specified in the BOQ. The painting shall be done as specified in the BOQ.
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 (This drawing is in the scope of bidder). 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 dia of medium thickness GI pipe for cable protection from trench to junction box for loop-in-

loop-out cable. All the above required materials shall be supplied by the bidder.

4. Each lighting pole JB shall be earthed by GI Flat bonded to 25 mm dia GI earth electrode of 3 meter length driven vertically in the ground. Suitable GI wire shall be taken from fixture to JB including fixing of clamps.

1.13.3.19.2. **LIGHTING FIXTURES:**

1. Light fittings shall be of weather proof with pressure die cast Aluminium housing, suitable reflector, heat resistant, toughened glass cover /equivalent with necessary neoprene gaskets, ingress protection IP 66 to prevent ingress of dust, moisture and insect, cable gland, earthing terminals etc. The housing shall be capable of being swiveled in both horizontal and vertical directions and locked in any desired position. It shall be supplied with appropriate driver (integral/Non- integral).

2. LED Light fitting shall be of wattage as specified in the BOQ.

1.13.3.19.3. **HIGH MAST LIGHTS**

1. The scope of works of High Mast Lights covers Erection, Earthing and Charging of High Mast along with its Accessories. High Masts Lights consisting of Mast shaft in multiple sections, head frame, steel wire rope, double drum winch, galvanized lantern carriage, luminaries and their control gear boxes, aviation obstruction lights, control/feeder panel etc. complete with all other accessories and interconnecting cables

1.13.3.19.4. **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 two mm 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 three mm 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 busbars.

8. LDBs shall be with one incomer with 250A Change over switch / /100A MCB, with required Nos of outgoing feeders with 32A/40A /63A/100A TPN MCBs/ 4 pole ELCB and three indicating lamps with fuses for indicating bus supply ON, voltmeter with selector switch and Power terminals. LDB shall be provided with earth stud, earth bus bar etc designated with labels. LDBs shall be as per relevant IS Standards.

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. The scope of erection of LDB includes providing two numbers of Earth pits with three-meter depth Earth electrode and connection using 25 X 3 GI flat.

VOLUME IA PART I CHAPTER XIV
TESTING AND COMMISSIONING

THE SCOPE OF THE WORKS WILL COMPRISE OF BUT NOT LIMITED TO THE FOLLOWING: (All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

1.14.1. SCOPE OF TESTING AND COMMISSIONING WORKS:

1.14.1.1. 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.

1.14.1.2. All T&P / instruments required for testing are to be arranged by the contractor. Any special equipment, tools and tackles, IMTEs etc. required for the successful completion of the Commissioning Tests shall be provided by the Contractor, free of cost.

1.14.1.3. All testing activities shall be carried out as per relevant standard, code of practice, manufacturer's instructions and BHEL norms. 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. All the above will be witnessed by BHEL engineer and the reports signed jointly.

1.14.1.4. The commissioning activities, tests, trial runs may have to be repeated till satisfactory results are obtained and also to satisfy the requirements of BHEL / customer / consultant / statutory authorities like boiler inspector, electrical inspector etc.

1.14.1.5. Prior to commissioning and after commissioning, protocols have to be made with BHEL / Customer. The formats will be given by BHEL and have to be printed by the contractor in adequate numbers.

1.14.1.6. It shall be the responsibility of the contractor to commission and attend any problem in the equipment erected by the contractor using various categories of workers in sufficient numbers along with Supervisors. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities. The commissioning group shall have the knowledge of various systems referred in the tender and possess adequate experience in testing and commissioning

1.14.1.7. All the tests at various stages shall be repeated till all the equipment satisfy the requirement of BHEL / Customer. Any rectifications required shall have to be done / redone by the contractor at his cost.

1.14.1.8. The contractor shall carryout any other test not listed in the tender but as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing,

pre-commissioning, commissioning, and operation, to demonstrate the completion of any part or whole work performed by the contractor.

1.14.1.9. In case, any rework is required because of contractor's faulty erection, which is noticed during pre-commissioning and commissioning, the same has to be rectified by the contractor at his cost. If any equipment / part is required to be inspected during pre-commissioning and commissioning, the contractor will dismantle / open up the equipment / part and reassemble / redo the work without any extra claim.

1.14.1.10. During commissioning any improvement / repair / rework / rectification / fabrication / modification due to design improvement / requirement is involved, the same shall be carried out by the contractor promptly and expeditiously

VOLUME IA PART I CHAPTER XV
PROGRESS OF WORK

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

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

1.15.1. Refer forms F -14 and F-15 of volume I D (Forms & Procedure) of volume -I book-II. Plan and review will be done as per the formats.

1.15.2. The progress reports shall indicate the progress achieved against plan, indicating reasons for delays, if any. The report shall also give remedial actions which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original plan the slippages do not accumulate and affect the overall programme.

1.15.3. It is the responsibility of the contractor to provide all relevant information on a regular basis regarding erection progress, labour availability, equipment deployment, testing, etc.

1.15.4. 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 employed are not sufficient BHEL will induct required additional workmen to improve the progress and recover all charges incurred on this account including all expenses together with BHEL overheads from contractor's bills.

1.15.5. Contractor is required to draw mutually agreed monthly erection programs in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.

1.15.6. Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities.

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

1.15.8. The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, consumables (gases / electrodes / ferrules / lugs) report, cranes availability report and other reports as per Performa considered necessary by the Engineer

as per the BHEL formats.

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

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

1.15.11. Monthly Plan and review will be done as per the Format provided in Form-14. (Any revision in the format during the contract will also be applicable).

1.15.12. The contractor shall submit any other details like Site organization chart, Progress photographs, Safety implementation report, pending materials and any other documents/reports required from BHEL for the activities planned during the subsequent month, etc. as sought by BHEL Engineer.

1.15.13. The contractor to reflect actual progress achieved during the month and submit to BHEL, so that slippages can be observed and necessary action taken in order to ensure that the situation does not get out of control, will update the construction schedule forming part of this contract each month.

VOLUME IA PART I CHAPTER XVI

PAINTING

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

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

1.16.1. FINAL PAINTING

1.16.1.1. The quoted rate / price shall be inclusive of supply and application of final painting of all the erected equipment like all steel items such as supports, racks, frames, HT / LT KIOSK, Transformer, etc. as per the painting specifications of BHEL.

1.16.1.2. In the case of steel fabricated items, raw steel after fabrication has to be cleaned and subsequent painting to be carried out.

1.16.1.3. All the exposed metal parts of the equipment including busducts, transformers, structures, etc., wherever applicable after installation unless otherwise specified the surface protected, are to be first painted with at least one coat of suitable primer and required number of finish coats as specified by BHEL which matches the shop primer paint used after thoroughly cleaning the dust, rust, scales, grease oil, and other foreign materials by wire brushing scrapping and chemical cleaning and the same being inspected and approved by BHEL engineers for painting. Afterwards the above parts shall be finished with as per the instructions of BHEL official.

1.16.1.4. Normally Paint shall be applied by brushing as per the instruction of BHEL Engineer. It shall be ensured that brush marks are minimum. If needed and insisted by BHEL in certain cases, spray painting has to be carried out within the Quoted rates. Spray painting gun and compressed air arrangement has to be made by the contractor himself within the Quoted rates.

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

1.16.1.6. Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of the ready mix type in original sealed containers as packed by the paint manufacturer. No thinners shall be permitted. Paint manufacturer's instructions shall be followed in method of application, handling, drying time etc.,

1.16.1.7. The scope of painting includes application of colour bands, lettering the names of the systems, equipments, danger / warning signs and other data as required by BHEL within the quoted rate.

1.16.1.8. All surfaces shall be thoroughly cleaned, free from scales, dirt and other foreign matter. Each coat shall be applied in an even & uniform film free from lumps, streaks, runs, sags and uncoated spots.

1.16.1.9. The actual colour to be applied shall be approved by BHEL before starting of actual painting work.

1.16.1.10. Primer & finish paint shall be of reputed paint supplier approved by BHEL. Contractor has to procure paints from the BHEL approved agencies only, and the paints should be as per the customer painting specification. The quality of the finish paint shall be as per the standards of IS or equivalent as approved by BHEL. Before procurement of paint the contractor has to obtain the clearance from BHEL authorities.

1.16.1.11. No paint shall be applied when the surface temp is above 55 deg. Centigrade or below 10 deg. Centigrade, and when the humidity is greater than 90% to cause condensation on the surface or frost / foggy weather.

1.16.1.12. Before commencement of final painting, contractor has to obtain written clearance from BHEL for effective completion of surface preparation.

1.16.2. PRESERVATION / TOUCH UP PAINTING

1.16.2.1. Supply & application of primer & finish paints with all manpower, tools & plants and consumables is covered in the scope of this tender.

1.16.2.2. Contractor shall carryout cleaning and preservation / touch up painting for the materials / equipment under this tender specification right from preassembly stage to till the equipment is cleared for final painting within the quoted rate.

1.16.2.3. Any equipment which has been given the shop coat of primer shall be carefully examined after its erection in the field and shall be treated with touch up coat of red oxide primer wherever the shop coat has been abraded, removed or damaged during transit / erection, or defaced during welding.

1.16.2.4. Mostly the equipment / items / components will be supplied with one coat of primer paint and one coat of finish paint. However, during storage and handling, the same may get peeled off / deteriorate. All such surfaces are to be thoroughly cleaned and to be touch up painted with suitable approved primer and finish paint matching with shop paint / approved final colour.

VOLUME IA PART I CHAPTER XVII
OPERATION AND MAINTENANCE

1.17.1. SCOPE OF OPERATION AND MAINTENANCE

1.17.1.1. Contractor shall maintain all the substations and free of cost till completion and energizing of the first 11KV/ 433V Substation in the Construction Power Supply network by BHEL Engineer after commissioning of the transformers, RMUS, VCB, etc. at BHEL incoming yard.. After completing and energizing aforesaid 11KV/ 433V Substation, BHEL shall declare for availing the services of the contractor for operation and maintenance of the system for the period specified elsewhere in the tender specifications.

1.17.1.2. The contractor shall operate and maintain all the electrical installation by deploying electrician, helpers, supervisor etc. on a three-shift basis as required as per the instruction of Engineer in charge.

1.17.1.3. All required consumables like insulation tape, HT tape, grease, oil, cable ties for maintenance of erected system shall be arranged by the contractor.

1.17.1.4. Contractor shall attend the break down and replace the defective components promptly, failing which BHEL will get the same done and recover the amount from the contractor with applicable overheads.

1.17.1.5. During the maintenance period, if the contractor fails to deploy adequate manpower continuously for two weeks, BHEL shall take suitable action as per contractual conditions.

1.17.1.6. All the tools and plants required for preventive maintenance and breakdown maintenance shall be arranged by the contractor.

1.17.1.7. All replacement materials / spares shall be supplied by BHEL free of cost. During the maintenance period, Contractor shall carry out the work of replacement of any defective items/ spares free of cost for all electrical installation.

1.17.1.8. The Cable repair work (Cable Joining) is under the contractor scope during Operation and Maintenance period as defined elsewhere in the tender specification. The required jointing kits will be supplied by BHEL free of cost.

1.17.1.9. The contractor shall provide to the satisfaction of BHEL, sufficient and qualified staff for the execution of works.

1.17.1.10. Supervisor should have a minimum qualification of Diploma in Engineering or any graduate with minimum 05 years of experience in Thermal Power Station. Electrician should be a certified Electrician from the respective state statutory body.

1.17.1.11. Also refer respective relevant clauses in other Chapters in Technical Conditions of Contract, Volume I Book I.

1.17.2. CODES AND STANDARDS

1.17.2.1. All equipment and materials shall be designed, manufactures and tested in accordance with the latest applicable Indian Standards (IS) except where modified and / or

supplemented by this specification.

1.17.2.2. Equipment and materials conforming to any other standard which ensures equal or better quality may be accepted. The electrical installation shall meet the requirement of Indian Electricity Rules as amended upto dates, relevant IS codes of Practice and Indian Electricity Act. In addition, other rules or regulations applicable to the work shall be followed. In case of any discrepancy, the more restrictive rule shall be binding.

1.17.2.3. A list of applicable standards is given below for reference.

- IS 3043 Code of practice for earthing
- IS 3072 Code of practice for installation and maintenance of switchgear
- IS 5216 Recommendations on safety procedures and practices in electrical work
- IS 800 General construction in steel - Code of practice
- IS 10028 (Parts 2 and 3) Code of practice for selection, installation and maintenance of transformers: Part 2 installation, Part 3 Maintenance
- IS 10322 (Part 1) Luminaires: Part 1 general requirements and tests
- IS 10322 (Part 5/Sec 1) Luminaires: Part 5 particular requirements: Sec 1 fixed general-purpose luminaires
- IS 10322 (Part 5/Sec 2) Luminaires: Part 5 particular requirements: Sec 2 recessed luminaires
- IS 10322 (Part 5/Sec 3) Luminaires: Part 5 particular requirements: Sec 3 luminaires for road and street lighting
- IS 10322 (Part 5/Sec 4) Specification for luminaires: Part 5 particular requirements: Sec 4 portable general-purpose luminaires
- IS 10322 (Part 5/Sec 5) Luminaires: Part 5 particular requirements: Sec 5 floodlights
- IS 10322 (Part 5/Sec 6) Luminaires: Part 5 particular requirements: Sec 6 handlamps
- IS 104 Specification for ready mixed paint, brushing, zinc chrome, priming
- IS 1180 (Part 1) Outdoor Type Oil Immersed Distribution Transformers Upto and Including 2 500 kVA, 33kV - Specification Part 1 Mineral Oil Immersed
- IS 1248 (Part 1) Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories Part 1 Definitions and General Requirements
- IS 1248 (Part 2) Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories Part 2 Special Requirements for Ammeters and Voltmeters
- IS 1248 (Part 3) Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories Part 3 Special Requirements for Wattmeters and Varmeters
- IS 1248 (Part 4) Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories Part 4 Special Requirements for Frequency Meters
- IS 1248 (Part 5) Direct Acting Indicating Analogue Electrical Measuring Instruments

and their Accessories Part 5 Special Requirements for Phase Meters, Power Factor Meters and Synchroscopes

- IS 1248 (Part 6) Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories Part 6 Special Requirements for Ohmmeters (Impedance meters) and Conductance Meters
- IS 1248 (Part 7) Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories Part 7 Special Requirements for Multi-Function Instruments
- IS 1248 (Part 8) Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories Part 8 Special Requirements for Accessories
- IS 1248 (Part 9) Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories Part 9 Recommended Test Methods
- IS 1255 Code of practice for installation and maintenance of power cables up to and including 33 kV rating
- IS 13234 Short - Circuit currents in three - Phase A.C. systems: Part 0 calculation of currents
- IS 1445 Specification for porcelain insulators for overhead power lines with a nominal voltage up to and including 1 000 V
- IS 15086 (Part 5) Surge Arresters Part 5 Selection and Application Recommendations
- IS 15505 Gaseous fire extinguishing systems - HCFC blend a extinguishing systems
- IS 1554 (Part 1) Specification for PVC insulated (Heavy Duty) electric cables: Part 1 for working voltages up to and including 1 100 V
- IS 1554 (Part 2) Specification for pvc insulated (Heavy Duty) electric cables: Part 2 for working voltages from 3.3 kV up to and including 11 kV
- IS 15652 , IEC 61111 Insulating mats for electrical purposes – Specification
- IS 1678 Prestressed concrete poles for overhead power traction and telecommunication lines – Specification
- IS 1866 Mineral insulating oils in electrical equipment supervision and maintenance guidance
- IS 1885 (Part 1) Electrotechnical vocabulary: Part 1 fundamental definitions
- IS 1885 (Part 30), IEC 60050-601 Electrotechnical Vocabulary: Part 30 Overhead Transmission And Distribution of Electrical Energy
- IS 1885 (Part 9/Sec 1) Electrotechnical Vocabulary Part 9 Relays Section 1 Elementary relays
- IS 1885 (Part 9/Sec 2) Electrotechnical Vocabulary Part 9 Relays Section 2 Time relays
- IS 1885 (Part 9/Sec 3) Electrotechnical Vocabulary Part 9 Relays Section 3 Measuring relays

- IS 1885 (Part 77), IEC Pub 50 (466) Electrotechnical vocabulary: Part 77 overhead lines
- IS 1885 (Part 81), IEC Pub 50 (302) Electrotechnical vocabulary: Part 81 electrical measuring instruments
- IS 1885 (Part 28), IEC Pub 50 (321) Electrotechnical vocabulary: Part 28 instrument transformers
- IS 1885 (Part 38), IEC Pub 50 (421) Electrotechnical vocabulary: Part 38 power transformers and reactors
- IS 1885 (Part 10) Electrotechnical vocabulary: Part 10 power system protection
- IS 2026 (Part 1) Power transformers: Part 1 general
- IS 2026 (Part 2) Power transformers: Part 2 temperature – Rise
- IS 2026 (Part 4) IEC 60076, Specification for power transformers: Part 4 terminal markings, tappings and connections
- IS 2026 (Part 3), IEC 60076-3 Power transformers: Part 3 insulation levels, dielectric tests and external clearances in air
- IS 2026 (Part 5) Power transformers: Part 5 ability to with stand short circuit
- IS 2121 (Part 1) Specification for conductors and earth wire accessories for overhead power lines: Part 1 armour rods, binding wires and tapes for conductors
- IS 2121 (Part 2) Specification for conductors and earth wire accessories for overhead power lines: Part 2 mid - Spain joints and repair sleeves - For conductors
- IS 2121 (Part 3) Conductors and earthwire accessories for overhead lines: Part 3 accessories for earth wire – Specification
- IS 2121 (Part 4) Conductors and earthwire accessories for overhead lines: Part 4 non - Tension joints – Specification
- IS 2486 (Part 1) Metal fittings of insulators for overhead power lines with nominal voltage greater than 1 000 V - Specification: Part 1 general requirements and tests
- IS 2486 (Part 2) Insulator fittings for overhead power lines with nominal voltage greater than 1 000 V - Specification: Part 2 dimensional requirements
- IS 2486 (Part 3) Specification for insulator fittings for overhead power lines with a nominal voltage greater than 1 000 volts: Part 3 locking devices
- IS 2486 (Part 4) Specification for insulator fittings for overhead power lines with a nominal voltage greater than 1 000 V: Part 4 tests for locking devices
- IS 2486 (Part 2) Insulator fittings for overhead power lines with nominal voltage greater than 1 000 V - Specification: Part 2 dimensional requirements
- IS 2486 (Part 1) Metal fittings of insulators for overhead power lines with nominal voltage greater than 1 000 V - Specification: Part 1 general requirements and tests
- IS 2705 (Part 1) Current transformers - Specification: Part 1 general requirements
- IS 2932 Enamel, synthetic, exterior: (a) Undercoating (b) Finishing - Specification :

Part 1 For domestic and decorative applications

- IS 3043 Code of practice for earthing
- IS/ISO 3156 Stranded wire ropes for mine hoisting - Impregnating compounds, lubricants and service dressings - Characteristics and tests
- IS 3347 HV Porcelain Bushing for transformer
- IS 335 New insulating oils – Specification
- IS 3637 Specification for gas - Operated relays
- IS 3639 Specification for fittings and accessories for power transformers
- IS 3961 (Part 2) Recommended current ratings for cables: Part 2 PVC insulated and PVC sheathed heavy duty cables
- IS 3961 (Part 3) Recommended current ratings for cables: Part 3 rubber insulated cables
- IS 3961 (Part 5) Recommended current ratings for cables: Part 5 pvc insulated light duty cables
- IS B398 (Part 1) Aluminium Conductors for Overhead Transmission Purposes Specification Part 1 Aluminium Stranded Conductors
- IS 398 (Part 2) Aluminium conductors for overhead transmission purposes - Specification: Part 2 aluminium conuuctors, galvanized steel – Reinforced
- IS 398 (Part 3) Specification for aluminium conductors for overhead transmission purposes: Part 3 aluminium conductors, aluminized steel reinforced
- IS 398 (Part 4) Aluminium conductors for overhead transmission purposes: Part 4 aluminium alloy stranded conductors (Aluminium - Magnesium - Silicon Type)
- IS 4257 (Part 1) Dimensions for clamping arrangements for porcelain transformer bushings: Part 1 for 12 kV to 52 kV bushings
- IS 5 Colours for ready mixed paints and enamels
- IS 5216 (Part 1) Recommendations on safety procedures and practices in electrical work: Part 1 general
- IS 5216 (Part 2) Recommendation on safety procedures and practices in electrical work: Part 2 life saving techniques
- IS 5613 (Part 1/Sec 1) Code of practice for design, installation and maintenance of overhead power lines: Part 1 lines up to and including 11 kV Sec 1 design
- IS 5613 (Part 1/Sec 2) Code of practice for design, installation and maintenance of overhead power lines: Part 1 lines up to and including 11 kV Sec 2 installation and maintenance
- IS 5613 (Part 2/Sec 1) Code of practice or design, installation and maintenance of overhead power lines: Part 2 lines above 11 kv and up to and including 220 kv sec 1 design
- IS 5613 (Part 2/Sec 2) Code of practice for design, installation and maintenance of

overhead power lines: Part 2 lines above 11 kV and up to and including 220 Kv: Sec 2 installation and maintenance

- IS 5819 Recommended short-circuit ratings of high voltage PVC cables
- IS 694 Polyvinyl chloride insulated unsheathed and sheathed cables/cords with rigid and flexible conductor for rated voltages up to and including 1 100 V
- IS 731 Specification for porcelain insulators for overhead power lines with a nominal voltage greater than 1000 V
- IS 732 Code of practice for electrical wiring installations
- IS 8130 Conductors for insulated electric cables and flexible cords – Specification
- IS 8270 (Part 1) Preparation of documents used in Electrotechnology - Part 1: Rules
- IS 8270 (Part 2) Industrial Systems Installations and Equipment and Industrial Products - Structuring Principles and Reference Designations - Part 2: Basic Rules
- IS 9974 (Part 1), IEC 662 Specification for high pressure sodium vapour lamps: Part 1 general requirements and tests
- IS 9974 (Part 2), IEC 662 Specification for high pressure sodium vapour lamps: Part 2 standard lamp data sheets

In addition to the standards mentioned above, all works shall conform to the requirements of the following rules and regulations.

a. Indian Electricity Act and Rules framed thereunder
b. Fire insurance regulations
c. Regulations laid down by the Chief Electrical Inspector of State and CEA
d. Regulations laid down by the Factory Inspector of State
e. Any other regulations laid down by the authorities.

In case any clause of contradictory nature arises between standards and this specification, the stringent condition shall apply.

1.17.3. TECHNICAL REQUIREMENT FOR ITEMS SUPPLIED BY THE CONTRACTOR

1.17.3.1. GENERAL

1.17.3.1.1. Equipment and material supplied shall comply with description, rating, type and size as detailed in this specification, drawings and annexures. Equipment and materials furnished shall be complete and operative.

1.17.3.1.2. All the accessories, fittings, supports, anchor bolts etc., which form part of the equipment or which are necessary for safe and satisfactory installation and operation of the equipment shall be furnished.

1.17.3.1.3. All parts shall be made accurately to standard gauges so as to facilitate replacement and repair. All corresponding parts of similar equipment shall be interchangeable.

1.17.3.1.4. Samples of all items shall be made available for purchaser's approval prior to supply of

item to site.

1.17.3.2. **FERRULES**

1.17.3.2.1. Ferrules shall be required for individual core of cable hence they shall be suitable for the insulated conductor diameter.

1.17.3.2.2. Ferrules shall be of plastic material.

1.17.3.2.3. Numbering on the ferrules shall be engraved type with contrast colour to the base. Engrave colouring shall be of durable quality to match the entire life of the system. Engraving shall be legible from a distance of 600 mm.

1.17.3.2.4. Ferrules shall be interlocking type in such a way that the interlocked ferrules take the shape of tube with complete ferrule number appearing in a straight line.

1.17.3.3. **TAGS**

1.17.3.3.1. Cables shall be provided with cable number tags for identification.

1.17.3.3.2. Cable tags shall be of durable fibre, aluminium or stainless-steel sheets.

1.17.3.3.3. Cable number shall be engraved type in case of aluminium or stainless-steel tags, and printed type in case of fibre sheet.

1.17.3.3.4. Tags shall be durable quality of size 60mm x 12mm with holes at both ends.

1.17.3.3.5. Samples of tags shall be approved by BHEL Engineer before delivery.

1.17.3.3.6. Tags shall be provided with non-corrosive wire of sufficient strength for tagging.

VOLUME-IA PART-II CHAPTER-I

CORRECTIONS / REVISIONS IN SPECIAL CONDITIONS OF CONTRACT, GENERAL CONDITIONS OF CONTRACT AND FORMS & PROCEDURES

Sl. No.: 01

Following Clauses in General Conditions of Contract (GCC) are modified/ revised/ added:

S.No	GCC Clause Reference	Modification / Revision / Addition in GCC Clause
1.	GCC Clause 1.9.1, Sl. No. (ii)	The following mode of deposit, Sl. No. (e) is added: e) Insurance Surety Bonds
2.	GCC Clause 1.10.3, Sl. No. (vi)	**The following Clause, Sl. No. (vi) is deleted**: Security deposit can also be recovered at the rate of 10% of the gross amount progressively from each of the running bills of the contractor till the total amount of the required security deposit is collected. However, in such cases at least 50% of the required Security Deposit, including the EMD, should be deposited in any form as prescribed before start of the work and the balance 50% may be recovered from the running bills as described above
3.	GCC Clause 1.10.3, Sl.No.(vii)	The following mode of deposit, Sl. No. (vii) is added: e) Insurance Surety Bonds
4.	Note mentioned under the GCC Clause 1.10.3	Note mentioned under GCC Clause 1.10.3 is revised as below: Note: **(1)** BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith. **(2)** In case of delay in submission of security deposit, enhanced security deposit which would include interest (Repo rate +4%) for the delayed period, shall be submitted by the bidder.
5.	GCC Clause 1.10.8	**GCC Clause 1.10.8 is revised as below:** Bidder agrees to submit security deposit required for execution of the contract within the time period mentioned. In case of delay in submission of security deposit, enhanced security deposit which would include interest (Repo rate+4%) for the delayed period, shall be submitted by the bidder. Further, if security deposit is not submitted till such time the first bill becomes due, the amount of security deposit due shall be recovered as per terms defined in NIT / contract, from the bills along with due interest
6.	GCC Clause 2.22.1	**GCC Clause 2.22.1 is revised as:** Retention Amount shall be 5% of the Contract Value and shall be furnished through BG in line with clause 1.12 of GCC **or** th**roug**h **Insurance Sure**ty B**ond** (**IS**B) before payment of first RA Bill. The validity of the said BG **/ IS**B shall be initially for the contract period & shall be extended, if so required, up to

S.No	GCC Clause Reference	Modification / Revision / Addition in GCC Clause
		acceptance of final bill. In case of increase in contract value, additional BG / ISB for 5% of differential amount shall be submitted by Contractor before payment of next RA Bill due. Retention Amount can also be recovered at the rate of 10% of the gross amount progressively from each of the running bills of the contractor till the total amount of the required retention amount is collected. In case, contractor opts cash deduction from RA bills in the beginning & subsequently offers to submit BG / ISB later on, then refund of deducted retention amount may be permitted against submission of BG / ISB for 5% of the Contract Value.
7.	New Clause for "Breach of Contract, Remedies and Termination" is added in place of existing clause of Risk & Cost (i.e. 2.7.2.1 to 2.7.3)	**1.Clause 2.7.2 and 2.7.3 are revised as:** **2.** **3.2.7.2 <u>Breach of Contract, Remedies and Termination</u>** **2.7.2.1** BHEL shall terminate the contract after due notice of a period of 14 days in any of the following cases, which if not rectified/ improved within the time period mentioned in the notice, then, 'Breach of Contract' will be considered to have been established: i). Contractor's poor progress of the work vis-à-vis execution timeline as stipulated in the Contract, backlog attributable to contractor including unexecuted portion of work does not appear to be executable within balance available period considering its performance of execution. ii). Withdrawal from or abandonment of the work by contractor before completion of the work as per contract. iii). Non-completion of work by the Contractor within scheduled completion period as per Contract or as extended from time to time, for the reasons attributable to the contractor. iv). Repeated failure of contractor in deploying the required resources, to comply the statutory requirements etc. even after given by BHEL is writing. v). Strike or Lockout declared is not settled within a period of one month. vi). Termination of Contract on account of any other reason (s) attributable to Contractor. vii). Assignment, transfer, subletting of Contract without BHEL's written permission. viii). Non-compliance to any contractual condition or any other default attributable to Contractor. **2.7.2.2 <u>Remedies in case of Breach of Contract is established</u>** In case 'Breach of Contract' is established, Security Deposit and Retention Amount shall be encashed/ forfeited. This is without prejudice to BHEL's right to levy of liquidated damages, debarment

S.No	GCC Clause Reference	Modification / Revision / Addition in GCC Clause
		etc. which shall be applied as per the provisions of the contract. Sequence of recovery to be made in case of breach of contract is established, is as below: a) In case the value of Security Deposit & Retention Amount, available for the Contract, is less than 10% of the Contract Value, the balance amount shall be recovered from dues available in the form of Bills payable to contractor, BGs against the same contract etc. b) Demand notice for deposit of balance recovery amount shall be sent to contractor, if funds are insufficient to effect complete recovery against dues indicated in (a) above. c) If contractor fails to deposit the balance amount to be recovered within the period as prescribed in demand notice, following action shall be taken for balance recovery: i) Dues payable to contractor against other contracts in the same Region shall be considered for recovery. ii) If recovery cannot be made out of dues payable to the contractor as above, balance amount to be recovered, shall be informed to other Regions/Units for making recovery from the Unpaid Bills/Running Bills/SD/BGs/Final Bills of contractor. iii) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor. Note: 1) In addition to above, levy of liquidated damages, debarment, termination, short-closure etc. shall be applied as per provisions of the contract. 2) If tendering is done for the balance work, the defaulted contractor (including all the members/partners in case of JV/ partnership firm) shall not be eligible for either executing the balance work or to participate in the tender(s) for executing the balance work. **2.7.3** In case Contractor fails to deploy the resources as per requirement informed by BHEL in writing to expedite the work, BHEL can deploy own/hired/otherwise arranged resources and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC.
8.	GCC Clause 2.7.7	**GCC Clause 2.7.7 is revised as:** BHEL may permit or direct contractor to demobilize and remobilize at a future date as intimated by BHEL in case of following situations for reasons other than Force majeure conditions and not attributable to contractor: i) suspension of work(s) at a Project either by BHEL or Customer,

S.No	GCC Clause Reference	Modification / Revision / Addition in GCC Clause
		or ii) where work comes to a complete halt or reaches a stage wherein worthwhile works cannot be executed and there is no possibility of commencement of work for a period of not less than three months 4. In such cases, charges towards demobilization and remobilization shall be as decided by BHEL after successful remobilization by contractor at site, and decision of BHEL shall be final and binding on the contractor. After remobilization, all conditions as per contract shall become applicable. In case Contractor does not remobilize with adequate resources or does not start the work within the period as intimated, then BHEL reserves the right to terminate the contract and effect remedies under Clause 2.7.2.2. Duration of the contract/time extension shall be revised suitably. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.
9.	GCC Clause 2.11.3	**GCC Clause 2.11.3 is revised as:** However, if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take under clause 2.7.2 of GCC i.e. "Breach of Contract, Remedies and Termination".
10.	GCC Clause 2.19.1	**GCC Clause 2.19.1 is revised as:** The contractor will be fully responsible for all disputes and other issues connected with his labour. In the event of the contractor's labour resorting to strike or the Contractor resorting to lockout and if the strike or lockout declared is not settled within a period of one month, it may be considered as 'Breach of Contract' under Clause 2.7 and the remedies under Clause 2.7.2.2 may be executed, at the discretion of BHEL.
11.	GCC Clause 2.24.1	**GCC Clause 2.24.1 is revised as:** Even though the work will be carried out under the supervision of BHEL Engineers the Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of Twelve months from the date of commencement of guarantee period as defined in Technical Conditions of Contract, for good workmanship and shall rectify free of cost all defects due to faulty erection detected during the guarantee period. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works, by itself, without prejudice to any other rights and recover the cost incurred for the same along with 5% overheads from the Security Deposit.

Sl. No.: 02

In addition to The EARNEST MONEY DEPOSIT (EMD) clause 1.9 and The SECURITY DEPOSIT (SD) clause 1.10 published in General Conditions of Contract (Volume I Book II) following is added for FDR

1. FDR should be Lien marked in favour of M/s BHEL.
2. Bank issuing FDR should agree to the following conditions and submit duly signed letter addressed to BHEL, confirming the following points:

a)There is no Lock in Period for Encashment of the Said FDR

b)The amount under the Said FDR would be paid to BHEL-PSSR on Demand, at any point of Time before, or upon Maturity, without any reference to the …… (Contactor Name).

c)Encashment whether premature or otherwise would not require any clearance from any other authority /Person.

d)FDR will be auto renewed for such period/s initially mentioned in the FDR and the intimation of Such renewal shall be sent to BHEL, PSSR and …… (Contractor), immediately after the renewal.

e)FDR will not be closed, Encashed, Changed or Discharged without the Written permission/Confirmation from M/s BHEL PSSR.

f)Bank to acknowledge and agree that the Lien created on the FDR shall be in Force until M/s BHEL PSSR, gives a Discharge Letter in this regard.

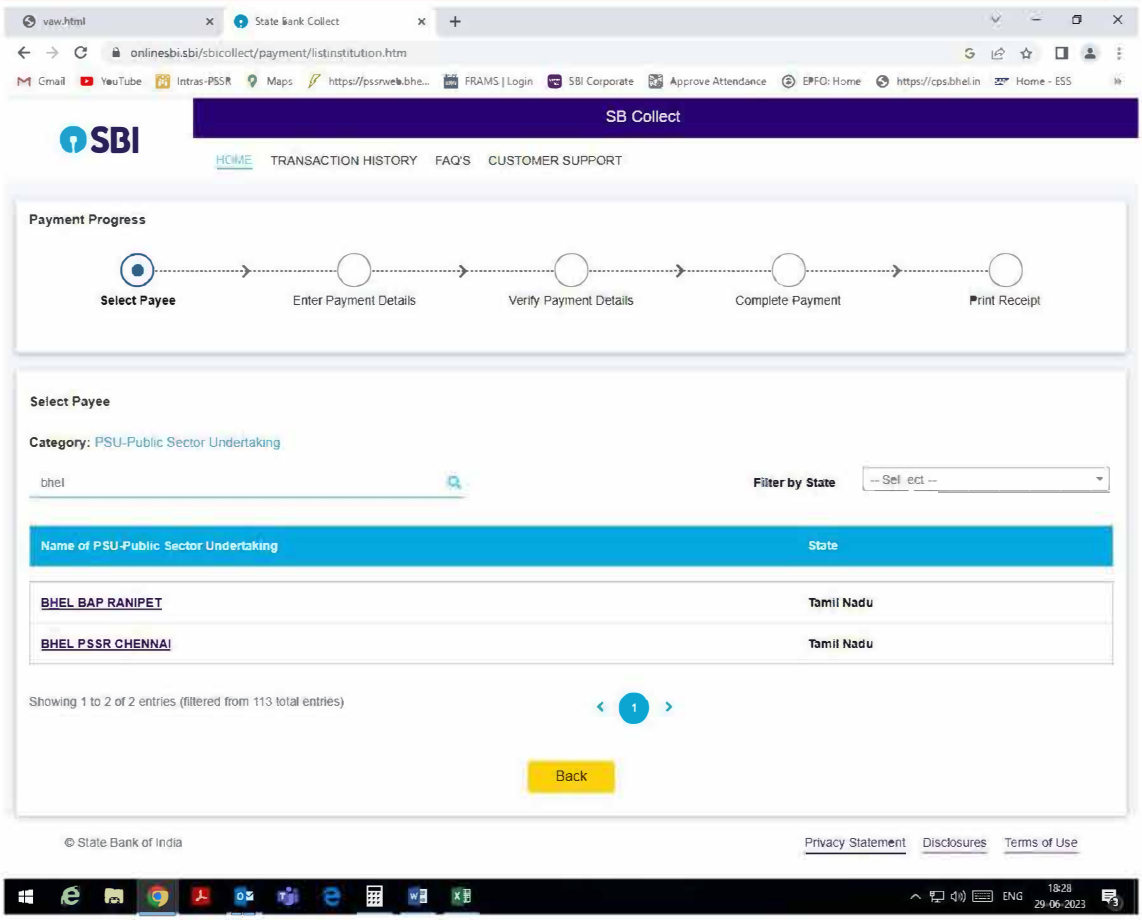
Sl. No.: 03

Detailed Instruction for EMD / Security deposits through SBI e-collect:

Step 1: Vendors may visit SBI collect website, the URL of which is https://www.onlinesbi.sbi/sbicollect where they get the home page with various categories of institutions.

Step 2: Select PSU - Public Sector Undertakings – leading to a page with list of PSUs

Step 3: Type BHEL and search, they get to see all BHEL divisions wherein they shall select BHEL PSSR Chennai. The screen shot of the same is given below.



Step 4: Select EMD receipts. Having selected the Payee in the Payment Progress, it will lead to the payment details – a drop down list of values. From that list, vendors shall select EMD receipts. Upon clicking the entry EMD receipts, a form will open asking for the remitters details and the details of the tender.

Step 5: Confirm details and pay

Fill in all the details correctly, verify the details, and complete the payment as it is leading to the payment gateway.

Step 6: Take a printout on completing the payment and enclose the copy of the same along with the bid submission. Store the copy of receipt for future reference.

Sl. No.: 04

VOID

Sl. no 05.
VOID

Following Clauses are modified in the Special Conditions of Contract (SCC)

Sl. No.: 06
Clause No. 10.5 on RA Bill Payments, in Special Conditions of Contract (SCC), Volume- IB, Book- II, is revised as under:

"The payment for running bills will normally be released within 30 days of submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc., and other dues in the meanwhile."

Sl. No.: 07

SCC Cl. No.	Existing Clause	Modified Clause
4.2.1.7	In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, **BHEL will make alternative arrangement at the risk and cost of the contractor……**	In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, **BHEL can deploy own / hired / otherwise arrange resources and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC……**
4.2.2.5	…… In case of any lapses on the part of the contractor, BHEL at its own discretion shall get the servicing / repair of equipment done **at the risk and cost of the contractor along with BHEL overheads**……..	……In case of any lapses on the part of the contractor, BHEL at its own discretion shall get the servicing / repair of equipment done **and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC**……..
5.14	…….If at any time, it is found that the contractor is not in a position to deploy the required engineers / supervisors / workmen due to any reason, BHEL shall have the option to make alternate arrangements **at the contractor's risk and cost. The expenditure incurred along with BHEL overheads thereon shall be recovered from the contractor.**	……..If at any time, it is found that the contractor is not in a position to deploy the required engineers / supervisors / workmen due to any reason, BHEL shall have the option to make alternate arrangements **and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC.**
6.1.11	If the material belonging to the contractor are stored in area other than those earmarked for his operation the engineer will have the right to get it moved to the area earmarked for the contractor **at the contractor's risk and cost**	If the material belonging to the contractor are stored in area other than those earmarked for his operation the engineer will have the right to get it moved to the area earmarked for the contractor **and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC.**

Sl. No : 8

Applicability of GCC Clauses for Package A and Package B

1.2.1 Package A

1.2.1.1 Retention Amount as per GCC Clause 2.22 shall be applicable.

1.2.1.2 Quantity Variation as per GCC Clause 2.14 for Package A will be with reference to the awarded price of Package A.

1.2.1.3 Following clauses of GCC is not applicable for Package A:

i. PVC as per GCC clause 2.17.
ii. ORC as per GCC clause 2.12.
iii. Secured Recoverable Advance as per GCC clause 2.13.

1.2.2 Package B

1.2.2.1 For Operation & Maintenance under Package B, payment for Monthly RA Bills shall be made as follows:

1.2.2.1.1 For the deployed manpower, monthly charges payable based on minimum wages and other statutory pay elements along with 5% service charges on such payments shall be paid.

1.2.2.1.2 The category of labour is considered as follows:

i. Electrician-Skilled Worker
ii. Helper- Unskilled Worker
iii. Supervisor- Highly Skilled Worker

1.2.2.1.3 The prevalent minimum wages and other statutory pay elements at site is indicated in Annexure A. Bidder to note that these may undergo change from time to time and the minimum wages and other statutory pay elements as on the day of actual execution along with corresponding service charge shall be paid to the contactor.

1.2.2.2 Following clauses of GCC is not applicable for Package B:

i. PVC as per GCC clause 2.17.
ii. ORC as per GCC clause 2.12.
iii. Secured Recoverable Advance as per GCC clause 2.13.
iv. Retention Amount as per GCC clause 2.22.
v. Extra Works as per GCC clause 2.15.
vi. Supplementary items as per GCC clause 2.16.
vii. Performance Guarantee for Workmanship as per GCC clause 2.24.

viii. Quantity variation as per GCC clause 2.14

1.2.3 Security Deposit

1.2.3.1 Security Deposit for Package A and Package B shall be submitted separately. The Security Deposits for both Package A and Package B are to be submitted before start of the work of Package A.

However, Security Deposit of each Package will be returned upon fulfillment of contractual obligation of the respective Package in line with GCC Clause 1.11.

1.2.4 Measurement of Work and Mode of Payment

1.2.4.1 Measurement of Work and Mode of Payment as per GCC clause 2.6 shall be dealt separately for Package A and Package B.

1.2.5 Rights of BHEL as per GCC clause 2.7

1.2.5.1 Rights of BHEL as per GCC clause 2.7 shall be dealt separately for Package A and Package B.

VOLUME IA PART II CHAPTER 2

DATA SHEET

2.2.1. SPECIFIC TECHNICAL REQUIREMENTS FOR SUPPLY ITEMS

2.2.1.1. Ferrules / Fire stop cable sealing system / tags: As per Clause

2.2.1.2. Tag

a. Material : Aluminium / Fiber / Stainless Steel

b. Markings : Engraving / Embossing / Printing

c. Size : As required.

2.2.1.3. Cable lugs of all size: Copper / Aluminium (crimping type)

2.2.1.4. Anchor fasteners for wall mounted cable trays / JBs

2.2.1.5. Insulation tape.

2.2.1.6. Paints required for primer & final coating and for protective coating.

2.2.1.7. Solder wire (Lead) -(60/40)

2.2.1.8. Panel sealing compound material (for cable entry from bottom / top of Panel).

2.2.1.9. Materials required for cable dressing. (GI / aluminum flats, PVC ties etc).

2.2.1.10. PVC wire marker sleeves and Tag plates

2.2.1.11. Welding electrodes, filler wires, gases etc.

2.2.1.12. Metallic clamps for flexible and rigid conduits

2.2.2. Wastage Allowance: Support installation : 1% by weight

VOLUME IA PART II CHAPTER 3

GENERAL TECHNICAL REQUIREMENTS AND GUIDELINES FOR INSTALLATION, TESTING, COMMISSIONING AND SUPPLY ITEMS

2.3.1. INSTALLATION, TESTING & COMMISSIONING IN GENERAL:

The stages of completion of various works shall be as follows:

Equipment shall be considered to be completely erected when the following activities have been completed.

- Moving of all equipment to the respective foundations.
- Fixing of anchor bolts or tack welding as required.
- Leveling and alignment of equipment.
- Assembling of all accessories such as relays, CTs, PTs, meters, instruments etc. as described in the job specification.
- Cable laying, termination with continuity check.
- Applying of finishing coat of paint.

All the equipment shall be tested at site to know their condition and to prove suitability for required performance. The site tests and acceptance tests to be performed by contractor are detailed below.

The contractor shall be responsible for satisfactorily working of complete integrated system and guaranteed performance.

2.3.2. SITE TESTS AND CHECKS

2.3.2.1. General

2.3.2.1.1. All the equipment shall be tested at site to know their condition and to prove suitability for required performance.

2.3.2.1.2. The test indicated in following pages shall be conducted after installation. All tools, accessories and required instruments shall have to be arranged by contractor. Any other test which is considered necessary by the manufacturer of the equipment, contractor or mentioned in commissioning manual has to be conducted at site.

2.3.2.1.3. In addition to tests on individual equipment some tests / checks are to be conducted / observed from overall system point of view. Such checks are highlighted under miscellaneous tests but these shall not be limited to as indicated and shall be finalized with consultation of client before charging of the system.

2.3.2.1.4. All checks and tests shall be conducted in the presence of client's representative and test results shall be submitted in six copies to client and one copy to Electrical Inspector. Test results shall be filled in proper proforma.

2.3.2.1.5. After clearance from Electrical Inspector system/equipment shall be charged in step by step method.

2.3.2.1.6. Based on the test results clear cut observation shall be indicated by testing engineer with regard to suitability for charging of the equipment or reasons for not charging are to be brought by the contractor.

2.3.2.2. **Trial Run Test**

After the successful test of each equipment as per standard test procedure the entire control system shall be put on trial run test on actual site conditions and operation of the system.

2.3.2.3. **Acceptance Test**

The acceptance test on the system shall be carried out by the contractor as per mutually agreed test procedures to establish satisfactorily functioning of the system as a whole and each equipment as part of the system.

2.3.3. TRANSFORMER

2.3.3.1. **INSTALLATION**

To ensure that a Transformer will function satisfactorily, it is important that handling, lifting, storing and assembling are carried out with great care and cleanliness by experienced personnel who know the various working operations very well.

2.3.3.2. **INSPECTION**

In connection with receiving and unloading at site, and at the final storing place before assembling, the transformers shall be inspected carefully. External visible damages as dents, paint damage etc. may imply that the transformer has been subjected to careless handling during transport and/or re-loading, and a careful investigation is therefore justified.

After the arrival of the material at receiving points, before unloading, the condition of packing and of the visible parts should be checked and possible traces of leaks. If necessary, appropriate statements and claims should be made.

Drums containing oil which have been separately despatched should be examined carefully for leaks or any sign of tampering. All despatched drums are filled upto their capacity and any shortage should be reported.

Check immediately the gas pressure at the arrival. A positive indicates that the tank and the transformer components respectively are tight, and that the active part including the insulation materials is dry.

If there is no positive gas-pressure, transformer should be immediately filled with dry Nitrogen gas at a pressure of 0.17 kg/cm2 (2.5 psi) without loss of time.

Otherwise, it should be checked if the core isolation is satisfactory and that accessories packed separately have not been damaged during transportation.

2.3.3.3. **UNLOADING**

Whenever rollers/trolleys are supplied with transformer, movement of transformer at site is carried out by mounting these rollers / trolleys.

Alternatively, for movement of transformer from loading bay to actual site of the equipment, skidding on greased rails etc can also be resorted to.

2.3.3.4. **STORING**

Dismantled equipment and components are packed to protect them against normal handling and transport stresses. The instructions for lifting given on the packages, must be complied with to avoid damages.

Goods stored outdoors must not be placed directly on the ground, and should be covered carefully with tarpaulin or similar materials.

Oil drum should be stored in horizontal (lying) position with both the bungs also in horizontal position.

2.3.3.5. **CHECK POINTS BEFORE STARTING AND DURING ERECTION**

a. Check points before starting erection.

i. Conditions of leads

ii. Bracing, clamping of leads

iii. Connections

iv. Tap changer checks

v. General conditions of insulation

vi. Core check that it has not moved in transit.

vii. Core-ground; this is checked with the megger after removing earth connection

viii. CTs, including the secondary leads and their passage through metal parts

ix. Check that shipping frame for bushings have been removed.

x. Check that coil position has not moved in transit

xi. Check for dirt, metal swarf, moisture

xii. Check that the bushing leads set without being too close to ground or other points of different potential.

b. Check-points during erection:

By means of the part list and the transformer / reactor OGA, the assembling of a fully completed transformer is carried out according to the following instructions. The following precautions are to be taken:

i. Fire-fighting equipment shall be available at the oil-treatment equipment as well as at work on and adjacent to the transformer.

ii. Welding work on or adjacent to the transformer shall be avoided, but if this is not possible, the work shall be supervised by fire-protection personnel.

iii. Smoking on or near the transformer shall not be allowed.

iv. Transformer tank, control cabinet etc, as well as assembling and oil treatment equipment shall be connected with the permanent earthing system of the station

v. Check that there is no overpressure in the transformer when blanking plates or connection lids are to be opened.

vi. All loose objects, tools, screws, nuts etc. shall be removed from the transformer cover before opening the connection and blanking lids.

vii. All loose objects (tools, pencils, spectacles etc.) shall be removed from the boiler-suit pockets etc. before starting the work through man-holes.

viii. Tools to be used inside the transformer e.g. for tightening of screws joint-shall be fastened to the wrist or another fixed point by means of cotton tape or string.

ix. Tools with loose sleeves and tools with catches must not be used at work inside the transformer.

x. Greatest possible cleanliness shall be observed at work inside the transformer, and at handling of part to be mounted inside the transformer.

xi. Fibrous cleaning materials should not be used as it can deteriorate oil when mixed with it.

xii. All components dispatched separately should be cleaned inside and outside before being fitted.

xiii. A Transformer is best protected for damp hazard by circulating warm, dry, de-aerated oil through it until it temperature is 5˚ C to 10˚ C above ambient. This should be done before allowing external excess to the interior of the tank. The warm oil should be circulated all the time transformer is open to atmosphere.

xiv. Oil pump & all joints in the oil pipe work should be air tight to avoid entrance of air through leakage joints.

xv. The active part (core and winding) should be exposed to the surrounding air as short time as possible. Open therefore only one blanking plate or connection lid at a time for remounting of bushing, valves etc.

xvi. Objects which despite all precaution are dropped inside transformer / reator, must absolutely be brought up from the equipment.

xvii. Check that the oxygen content inside the transformer tank is minimum 20% if a person is to enter the tank.

2.3.3.6. **ASSEMBLY**

Assembly of wheels Bushing Valves, cooling device, Oil conservator, Pilol Flanges, Blanking plates and accessories like cooling fans, pumps, OLTC and components for

supervision and control oil level indicator, flow indicators, gauges, Buchholz relay, PRV, thermometers etc. are assembled according to leaflet / description valid for the components.

2.3.3.7. **OIL FILLING**

The following procedure is recommended.

i. Close and blank the valve to isolate the conservator from main tank. Fill the oil in transformer under vacuum up to Buchholz level as per instructions given elsewhere.

ii. After filling the oil in transformer and breaking the vacuum, oil can be filled in the conservator either through reactor or by drain valve.

iii. Remove the inspection cover (ii) provided on the side of the conservator and check the air cell assuring that it is inflated. The air must remain in fully inflated condition during oil filling operation. If the air cell is found deflated fit the inspection cover and inflate the air cell with dry air / nitrogen gas to 0.035 kg/sq.cm max. A gauge may be put by removing plug. After filling close these connections.

iv. Remove air release plugs provided on top of the conservator.

v. Slowly pump the oil through main reactor / drain valve. Temporarily stop filling operation when oil starts coming from opening after ensuring that no air bubbles come out through these air release holes. Fit the two air release plugs.

vi. Continue oil filling till oil start coming from air release plug. Stop oil after ensuring that no air bubbles come out. Fit the plug.

vii. Now release the air pressure held inside the air cell from point and continue oil filling until magnetic oil gauge indicates 35 deg. C level.

viii. Remove oil pump and connect air cell to breather from point. Also remove pressure gauge and put plug.

ix. The system is now properly filled. Air release plugs are fitted in normal operation.

2.3.3.8. **Equipment for Oil-Filling Under vacuum (As required)**

i. High-vacuum storage oil filtration plant provided with thermostat-controlled oil heaters and vacuum-proof hoses with dependent vacuum pumping system for tank evacuation. Capacity :6 kl/hr

ii. Oil-storage tanks provided with silica-gel breathers and inlet / outlet valves for oil circulation. Recommended capacity 20kl

iii. Vacuum gauges provided in filtration plant.

iv. Equipment for measurement of electric strength (BDV) of oil - 100 kv set.

v. Equipment for moisture content of oil.

vi. Equipment for measurement of Resistivity and Tan delta at 90 C. (As applicable)

vii. Transparent vacuum-proof tubes for checking of oil-level during oil filling.

viii. Valves, fitting, gaskets etc.

ix. Dry nitrogen cylinders.

2.3.3.9. **COMMISSIONING**

Testing after Assembly of the Transformer

After the transformer has been assembled at site, it shall be tested in order to check that it has not been damaged during transport and assembly to such an extent that its future operation will be at risk. Regarding the performance of the test, refer to the testing method as per standards. The results of the test shall be documented.

COMMISSIONING CHECKS

Sl.No.	DESCRIPTION
1.	Breather Silica gel (Blue when dry)
2.	Oil in the Breather housing cup.
3.	All valves for their correct opening and closing sequence.
4.	Oil level in conservator tank.
5.	Oil in cooling system.
6.	Oil level in bushings.
7.	Release air, wherever necessary.
8.	Cooling accessories (Pump motors, Fan motors etc.) for direction and O/L setting.
9.	Buchholz, oil level indicator, pressure gauges, thermometer, Temp. indicators etc.
10.	Neutral earthing.
11.	Earth Resistance of Electrodes.
12.	Earthing of bushing test tap.
13.	Check oil leakage for 24 hrs.
14.	Check Auxiliary circuit voltage (415 V)
15.	Calibration of OTI / WTI with hot oil.
16.	Check Working of WTI / RTD repeaters at control room.
17.	IR of core to earth.
18.	Die electric strength of oil PPM & Chemical analysis, specific gravity test
19.	IR tests on windings to earth and between winding
20.	Phase sequence test & vector group check
21.	Continuity test
22.	No load voltage ratio on all tap position

Sl.No.	DESCRIPTION
23.	Winding resistance in all taps
24.	Tap changing at 415v 3 50 Hz supply in all three phases
25.	TAN-DELTA test if quality check list calls for.
26.	Dew point check for N_2 Gas at the time of oil filling

INSULATION RESISTANCE TEST

Sl.No	Description	Date	Time in Hrs	Megger (See note (3)	IR Value	Temp	Remarks
1	Control wiring						
2.	Tap Changer						
a)	Motor						
b)	Control						
3.	Cooling system						
a)	Motor Fan						
b)	Motor pump						
c)	Control Wiring						
4.	Main Winding						
a)	HV/E+LV						
b)	LV/E+HV						
c)	HV/IV						
d)	IV/LV						
e)	HV/LV						

Note :-

1. While checking these values no external, lightning arrestors etc should be in circuit.
2. Special care should always be taken while meggering the transformer winding to ensure that there is no leakage in the leads.
3. Megger voltage to be decided based on the voltage rating of equipment under test.

Oil Characteristics.

Take necessary precaution (regarding rinsing the bottle, cleaning hand, air bubble etc) while withdrawing the samples, each sample should be free of air bubbles and should not be tested when it is hot. The sample should satisfy IS:1866.

1 Tank Top Sample Bottom Sample
2 Cooling system Top Sample Bottom Sample
3 OLTC Divertor (each phase)

Tests on CT

1 Ratio
2 Polarity
3 Magnetizing current
4 IR Value

Potential Transformer Tests

1 IR test of primary winding by HV megger between windings
2 IR test of secondary winding by LV megger between winding and winding to earth
3 Checking of voltage ratio
4 Verification of terminal markings and polarity
5 Checking of oil level if applicable
6 Checking of continuity and IR values for cables from PT to M
7 Checking tightness of earthing connection.
8 Checking of insulator for cracks
9 Checking output on charging of the system with connected meter

On Load Tap changer

Sl.No	Description	Date	Observation	Remarks
1	Visual Inspection of equipment.			
2	Hand operation on II taps.			
3	Complete wiring of the circuits			
4	Limit Switch			
5	Over running device			
6	Remote Panel Wiring.			
7	Overload Device of Driving Motor.			
8	Local Operation (Electrical)			
9	Remote Operation (Electrical)			
10	Tap Position Indicator.			
11	Step by step contractor			

12	Out of Step Relay.			

Note

1) While operating the mechanism on Electrical Control, check once again limit switches, step by step contractor, over running device etc. for their actual operation and prove that they are functioning properly.

2) For More details Please refer Respective Manuals.

2.3.4. GUIDELINES FOR ERECTION OF HT SWITCHGEAR PANELS

2.3.4.1. **Erection**

The base frames will be supplied normally along with the boards. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not available, the same will have to be fabricated and painted at site. Base frames shall be grouted on the openings which shall be made on the floor during the time of casting. All necessary concrete chipping and finishing works are to be completed.

2.3.4.2. All the panels/board shall be placed on its foundation or supporting structures and shall be assembled as required. All panels should be installed with parallel, horizontal and vertical alignment by skilled craftsmen.

2.3.4.3. All the boards will be delivered in sections. Necessary interconnection of busbar, bolting of panels, left out panel / interpanel wiring, etc. will have to be done after assembling the panel.

2.3.4.4. The Following Points shall be Checked up during Erection

1) Layout of foundation channels.
2) Floor level covered by the panel with respect to main floor level.
3) Location and serial no. of panels.
4) Positioning of panels.
5) Verticality of switchgear panels within the limit specified.
6) Freeness of Breaker Truck and modules in housing and its manual operation.
7) Earthing of panels and breaker truck to station earth.
8) Lugs for termination of HT and LT cables.
9) Mounting and fixing arrangements of Bus bars.
10) Tightening of Busbar jointing bolts as specified.
11) Clearance between:
    i. Phase to Phase
    ii. Phase to earth
12) Minimum clearance for:
    i. Breaker, Truck and modules withdrawal

ii. Distance required for maintenance work

13) Check the operation of:
i. Remote control
ii. Various required - closing / tripping / alarm / indications / interlocks

14) Installation position of instruments and relays
Operation of relays and meters by secondary injection.

15) AC/DC supplies for panel Final relay settings as per customer requirements.

16) Tightness of terminal connections for HT & LT connections.

17) Opening operation of breaker, manually and electrically.

18) Working of ammeters and voltmeters for their entire range and other panel mounted instruments like recorder, indicator etc.

2.3.4.5. **HT SWITCHGEAR TESTS**

1) IR test
2) HV one-minute P.F. test checking of oil level
3) Measurement of contact resistance for HT breakers
4) Test to prove inter changeability of similar parts (including breaker module)
5) Testing of relays as per supplier's commissioning manual
6) Testing and calibration of all meters.
7) Operation of all relays by secondary injection method as per supplier's manual
8) Testing of CT polarities and CT ratio by primary injection test.
9) Measurement of knee point voltage and secondary resistance for CTs used for differential protection.'
10) IR and voltage ratio test for PTs
11) Functional test of all circuit components for each panel / feeder.
12) Test to prove closing/tripping operation at minimum and maximum specified voltage in test and service position.
13) Check for drawout test and service position of breakers for all feeders.
14) Check for covering of all openings in the panel - check for continuity and operation of aux. contacts of breaker.
15) HV test on vacuum interrupters (for VCBs)
16) Check for pressure of SF6 gas and air (for SF6).

2.3.5. LT SWITCHGEAR PANELS

2.3.5.1. **Erection**

a. The base frames will be supplied normally along with the boards. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the

base channels are not available, the same will have to be fabricated and painted at site. Base frames shall be grouted on the openings which shall be made on the floor during the time of casting. All necessary concrete chipping and finishing works are to be completed.

b. All the panels/board shall be placed on its foundation or supporting structures and shall be assembled as required. All panels should be installed with parallel, horizontal and vertical alignment by skilled craftsmen

c. All the boards will be delivered in sections. Necessary interconnection of busbar, bolting of panels, left out panel / inter panel wiring, etc. will have to be done after assembling the panel.

2.3.5.2. **Checks during erection**

1. Layout of foundation channels.
2. Floor level covered by the panel with respect to main floor level.
3. Location and serial no. of panels.
4. Positioning of panels.
5. Verticality of switchgear panels within the limit specified.
6. Freeness of Breaker Truck and modules in housing and its manual operation.
7. Earthing of panels and breaker truck to station earth.
8. Lugs for termination of LT cables.
9. Mounting and fixing arrangements of Bus bars.
10. Tightening of Busbar jointing bolts as specified.
11. Clearance between:
    i. Phase to Phase
    ii. Phase to earth
12. Minimum clearance for:
    i. Breaker, Truck and modules withdrawal
    ii. Distance required for maintenance work
13. Check the operation of:
    i. Remote control
    ii. Various required - closing / tripping / alarm / indications / interlocks
14. Installation position of instruments and relays
    Operation of relays and meters by secondary injection as per supplier's manual.
15. AC/DC supplies for panel
    Final relay settings as per customer requirements.
16. Tightness of terminal connections for HT & LT connections.

17. Opening operation of breaker, manually and electrically.
18. Working of ammeters and voltmeters for their entire range and other panel mounted instruments like recorder, indicator etc.

2.3.5.3. **LT Switchgear tests**

1. IR test
2. Measurement of contact resistance for LT breakers
3. Test to prove inter changeability of similar parts (including breaker module
4. Testing of relays as per supplier's commissioning manual.
5. Testing and calibration of all meters.
6. Operation of all relays by secondary injection method as per supplier's manual.
7. Testing of CT polarities and CT ratio by primary injection test.
8. Measurement of knee point voltage and secondary resistance for CTs used for differential protection
9. IR and voltage ratio test for PTs
10. Functional test of all circuit components for each panel / feeder
11. Test to prove closing / tripping operation at minimum and maximum specified voltage in test and service position
12. Check for draw out test and service position of breakers for all feeders
13. Check for covering of all openings in the panel - check for continuity and operation of aux. contacts of breaker.

2.3.6. GUIDELINES FOR CABLE LAYING

1 Also refer cable laying clause in chapter – XIII.

2 Cables laid exposed in racks/trays and routed through trenches / tunnels / basements etc. to individual drive/control devices etc. shall be taken in embedded surface exposed rigid GI conduits and or flexible conduits unless directly terminated to the equipment in the panels located, above trenches, tunnels or basement.

3 All cables routed along walls or in equipment rooms shall be protected by means of laying them through GI pipes or by providing sheet metal covers upto a height of 2000 mm from the working floor levels and platforms, for protection against mechanical damage. All vertical risers shall be of enclosed type.

4 Cable trays shall be supported on ISA 50x50x6mm MS/GI brackets. Brackets shall be welded to steel plate inserts in the trenches / tunnels or supporting channel angle / inserts in other areas.

5 Wherever cables are to be laid below roads and railway tracks, the same shall be taken through ducts buried at a suitable depth as decided by Engineers.

6 Laying and installation of power, control and special cables shall generally conform to IS : 1255

7 The cables shall be laid-out in proper direction from the cable drums (opposite to the normal direction of rotation for transportation).

8 In case of higher size cables, the laid out cables shall run over rollers placed at close intervals and finally transferred carefully on the racks/trays. Care shall be taken so that kinks and twists or any mechanical damage does not occur to cables. Only approved cable pulling grips or other devices shall be used. Under no circumstances cables shall be dragged on ground or along structure while paying out from cable drums, carrying to site and straightening for laying purpose.

9 Suitable extra length of cables shall be provided for all feeders for any future contingency, in consultation with Engineer.

10 Cable runs shall be uniformly spaced, properly supported and protected in an approved manner. All bends in runs shall be well defined and made with due consideration to avoid sharp bending and kinking of cable. The bending radius of various types of cables shall not be less than those specified by cable manufacturers and that specified in IS 1255.

11 All cables shall be provided with identification tags indicating the cable numbers in accordance with the cable circuit schedule. Tags shall be fixed at both ends of cables (both inside & outside of panel) both sides of floor / wall crossings, every 25m spacing for straight runs or as specified by Engineer for easy identification of cable.

12 When a cable passes through a wall, cable number tags shall be fixed on both sides of the wall.

13 Single core cables for AC Circuits shall form a complete circuit in trefoil formation supported by means of trefoil clamps of non-magnetic material.

14 Multi-core cables above 1100 V grade shall be generally laid in ladder type trays in one layer with spacing not less than one cable diameter of bigger diameter cable.

15 All 1100 V grade multicore power cables and single core DC cables shall be placed in single layer, touching each other and clamped by means of single or multiple galvanised MS saddles / aluminium strips / nylon cable ties. Cables above 35mm diameter shall be clamped individually.

16 Control cables shall be laid touching each other and wherever required may be taken in two layers. All control cables shall be clamped with a common clamp/tie.

17 Segregation of the cables on the basis of their types and their functions shall be as under for horizontal formation:

17.1 HT cables shall be laid in the top tier(s)

17.2 LT power cables to be laid in the tray(s) below the HT cable trays.

17.3 LT control cables to be laid in the Tray(s) next below to the LT power cable (trays)

17.4 Special control cables including screened control cables to be laid in the bottom most tray(s).

18 For vertical formations, the trays closest to the wall shall be considered as bottom most tray and the order indicated in clause just above shall be followed. However, where there is no clear distinction of bottom / top trays, the order convenient for linking the horizontal and vertical formations shall be followed.

19 When it may not be possible to accommodate the cables as per the criteria indicated in the two clauses 17 & 18 indicated above, the following rules shall override the criteria. However, prior approval of the Engineer will be required. In hierarchical order:

19.1 Control cables are mixed up with the special control cables with clear minimum gap of 100 mm between them.

19.2 LT power cables are mixed up with control cable with clear minimum gap of 150 mm between them.

19.3 LT power cables are mixed up with HT power cables with clear minimum gap of 200 mm between them.

19.4 LT power cables are mixed up with special control cables with clear minimum gap of 200 mm between them.

20 To facilitate pulling of cables in GI conduits, powdered soft stone, plastic scoop or other dry inert lubricant may be used but grease or other material harmful to the cable sheaths shall not be used.

21 No single core cable shall pass through a GI conduit or duct except DC single core cables. AC single core cables shall pass through GT conduits / pipes in trefoil formation only.

22 In case of a 3 phase, 4 wire system, more than one single phase circuit, unless originating from the same phase shall not be taken in the same GI conduit.

23 Entry of cables from underground trenches to the buildings or tunnels shall be by some approved method. Necessary precautions shall be taken to make the entry point fully water tight by properly sealing the pipe sleeves wherever they enter directly into the building at trench level. The sealing shall be by cold setting compound. Any alternative sealing arrangement may be mutually agreed with BHEL Engineer.

24 Wherever specific cable routes are not shown in cable schedules cables shall be laid as directed by Engineer.

25 SUPPORT SPACINGS & CLAMPINGS
Support spacing and clamping are suitably provided and as required

26 LAYING OF CABLES DIRECTLY BURIED IN GROUND
Laying and installation of directly buried cables in ground shall conform to the requirements of IS 1255.

27 SUPPORT SPACINGS & CLAMPINGS

Trefoil Clamps:	
i. Horizontal run spacing	1000 mm (max)
ii. Vertical run spacing	1000 mm (max)
iii Axial spacing between adjacent trefoils	Double the diameter of larger cable or 150 mm Whichever is less

Other Clamps

A. Power Cables:

Above 35mm OD

i Horizontal runs: Individually clamped at 3000 mm Interval (max)

ii Vertical runs: Individually clamped 3000mm intervals (max).

Upto 35mm OD

i Horizontal runs: Collectively clamped at 3000 mm intervals (max)

ii Vertical runs: Collectively clamped at 2000 mm interval (max)

B. Control Cables:

i Horizontal runs: Collectively clamped at 3000 mm interval (max)

ii Vertical runs : Collectively clamped at 3000 mm interval (max)

C. Spacing for cables supported along structure/ceiling

Clamping Spacing:

i In horizontal runs : 750mm (max)

ii In vertical runs : 750mm (max)

Spacing between cables : 30 mm (min)

Note:

a. Supports shall also be provided at each bend.

b. For any change in above spacing, prior approval of Engineer will be taken

28 CABLE TERMINATION AND JOINTING

a. When the equipment are provided with undrilled gland plates for cable/conduit entry into the equipment, drilling and cutting on the gland plate and any minor modification work required to complete the job shall be carried out at site and drawings shall be prepared and engineer's approval taken before drilling holes. Cutting shall not be allowed.

b. Termination of cables shall be done as per termination drawings & interconnection diagrams furnished to the contractor. Looping of cores / wires at terminals as shown in interconnection diagrams is to be done.

c. All cable entries in the equipment shall be sealed after glanding the cables.

d. Adequate length of cables shall be pulled inside the switch boards, control panels, terminal boxes etc. as per near termination of each core/conductor.

e. Power cable terminations shall be carried out in such a manner as to avoid strain on the terminals by providing suitable clamps near the terminals.

f. End sealing / termination of cables shall be done by means specified on the specification for terminations. The system shall be suitable for types of cable specified and complete with stress relief system.

g. Termination and jointing of aluminium / copper conductor power cables shall be done by means of compression method using compression type aluminium / tinned copper lugs.

h. Copper conductor control cables shall be terminated directly into screwed type terminals provided in the equipment. Wherever control cables are to be terminated by means of terminal lugs, the same shall be of tinned copper compression type.

i. Cable joints shall normally be made at an intermediate point in the straight run of the cable only when the length of the run is more than the standard drum length supplied by the cable manufacturer. In such cases, when jointing is unavoidable, the same shall be made by means of specified cable jointing kit, subject to BHEL's Engineer approval for deciding location of joint.

j. Termination and jointing shall generally conform to the requirements of IS: 1255 and shall strictly conform to the recommendations of termination and jointing kit supplier.

29 TESTING OF CABLES:

i. The contractor shall submit to the Engineer a checklist for testing and commissioning and the activities shall be carried out in accordance with the checklist.

ii. Testing and electrical measurement of cable installations shall conform to IS : 1255

iii. Prior to installation, cables shall be tested for:
   a) Continuity of conductors
   b) Insulation resistance between conductors & earth
   c) Insulation resistance between conductors.

iv. After installation cables shall be tested for:
   a) Insulation resistance between conductors & iron
   b) Insulation resistance between conductors & earth
   c) Conductor resistance
   d) Capacitance between conductors & earth (for cables above 7C.1.3KV grade)
   e) DC high voltage test (for LT power cables of higher sizes interconnecting PCCs & MCC)
   f) Absence of cross phasing
   g) Firmness of terminations.

2.3.7. TECHNICAL REQUIREMENT FOR ITEMS SUPPLIED BY THE CONTRACTOR.

2.3.7.1. GENERAL

Equipment and material supplied shall comply with description, rating, type and size as detailed in this specification, drawings and annexures.

Equipment and materials furnished shall be complete and operative.

All the accessories, fittings, supports, anchor bolts etc., which form part of the equipment or which are necessary for safe and satisfactory installation and operation of the equipment shall be furnished.

All parts shall be made accurately to standard gauges so as to facilitate replacement and repair. All corresponding parts of similar equipment shall be interchangeable.

Samples of all items shall be made available for purchaser's approval prior to supply of item to site.

2.3.7.2. FERRULES

a) Ferrules shall be required for individual core of cable hence they shall be suitable for the insulated conductor diameter.

b) Ferrules shall be of plastic material.

c) Numbering on the ferrules shall be engraved type with contrast colour to the base. Engrave colouring shall be of durable quality to match the entire life of the system. Engraving shall be legible from a distance of 600 mm.

d) Ferrules shall be interlocking type in such a way that the interlocked ferrules take the shape of tube with complete ferrule number appearing in a straight line.

2.3.7.3. TAGS

a) Cables shall be provided with cable number tags for identification.

b) Cable tags shall be of durable fibre, aluminium or stainless steel sheets.

c) Cable number shall be engraved type in case of aluminium or stainless steel tags, and printed type in case of fibre sheet.

d) Tags shall be durable quality of size 60mm x 12mm with holes at both ends.

e) Samples of tags shall be approved by BHEL Engineer before delivery.

f) Tags shall be provided with non-corrosive wire of sufficient strength for taggings.

2.3.7.4. FIRE STOP CABLE SEALING SYSTEM (AS APPLICABLE)

Fire stop cable sealing system shall have two (2) hours fire protection rating suitable for sealing both vertical & horizontal cable penetrations. The sealing compound in conjunction with mineral wool shall form effective fire seals. The sealing compound shall have special property to allow for short circuit conditions. **GPG fire stop sealing compound** or equivalent sealing compound shall be used.

2.3.8. GUIDELINES FOR ERECTION OF GI PIPES, SUPPORTS & ACCESSORIES

2.3.8.1. For installation of cables in GI conduits the conduits shall be installed first without cables but having suitable pull wires laid in conduits.

2.3.8.2. For equipment and devices having GI conduit entry arrangement other than standard GI conduit adopter, adopters shall be provided as required to enable the GI conduit to be properly terminated, between conduit end and motor T.B.

2.3.8.3. GI conduits shall run without moisture or water traps and shall be made drawing arrangement towards the end.

2.3.8.4. The entire GI conduit system shall be firmly fastened in position. All boxes and fittings shall generally be secured independently from the GI pipes entering them.

2.3.8.5. Bends of GI pipes / conduits shall be made without causing damage to the pipes / conduits.

2.3.8.6. Occupancy of conduits shall not be greater than 40%.

2.3.8.7. The adopter for coupling rigid GI pipe / conduits and flexible conduit shall be of aluminum or galvanized steel.

2.3.8.8. Transportation and storage of cable drums shall generally conform to the requirements of IS: 1255.

2.3.8.9. All those cables which are in BHEL scope shall be supplied to the contractor free of cost from BHEL / Customer's store / storage area. Transportation of cables from storage area to the work site shall be the responsibility of the contractor.

2.3.8.10. The cable drums shall be transported on wheels to the place of work.

Note:

The test specified above for all the electrical equipment are not exhaustive. Any other pre-commissioning and field tests not included in the above list but necessary as per relevant standards, Electricity rules, code of practice and instructed by the manufacturer of the equipment shall also have to be carried if deemed necessary shall be carried out as per requirement either within the quoted rates / price or at additional cost. Decision of Engineer in charge will be the final regarding additional cost for testing. The contractor shall take the full responsibility of testing, commissioning, trial run and successful operation of the equipment and the entire system.

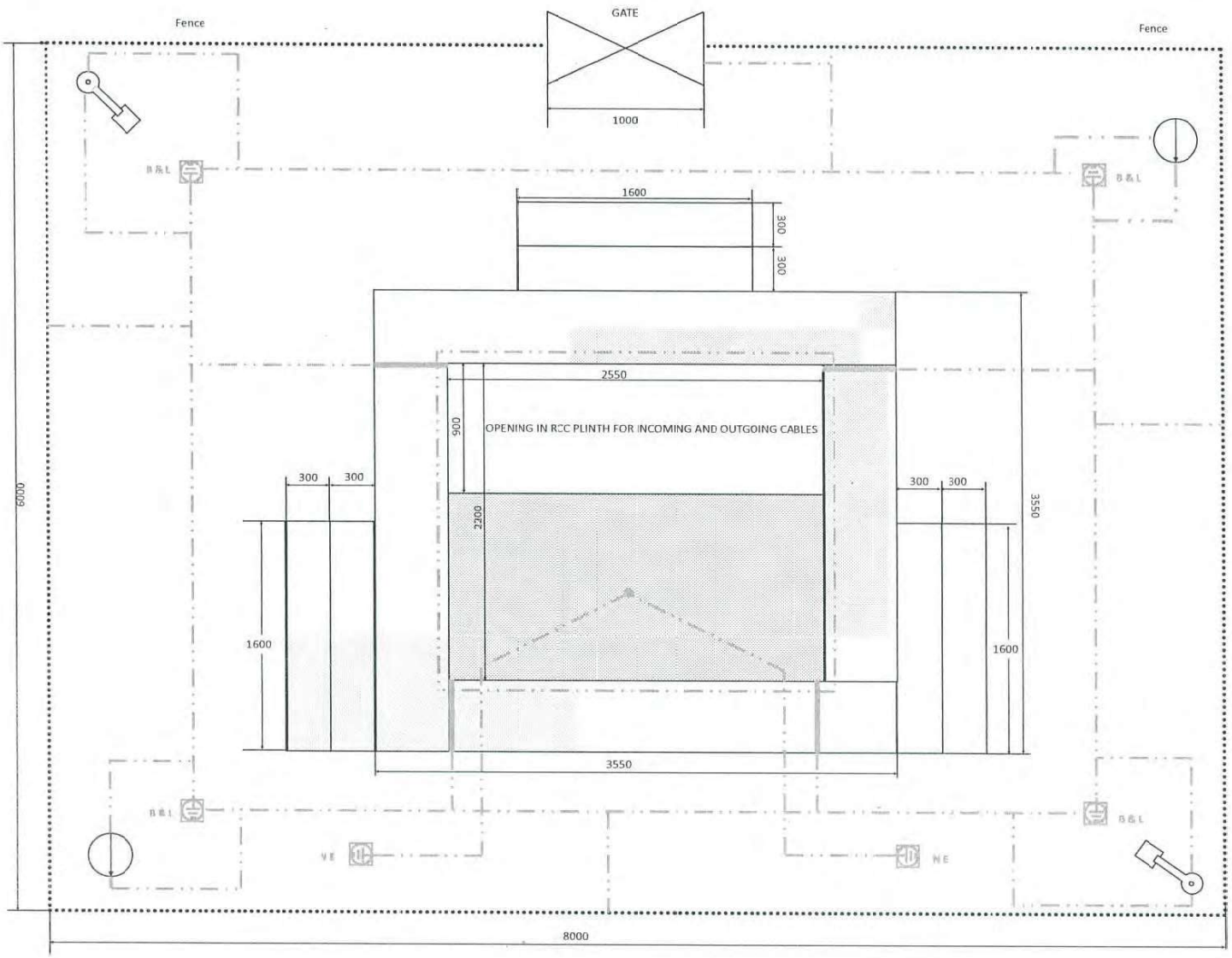
VOLUME IA PART II CHAPTER 4

DRAWINGS

The following drawings provided are indicative in nature and for tendering purpose only.

Sl. No	Description	No. of Pages
1	Plot Plan	01
2	Skid Mounted Substation drawings	03
3	Earth Pit	01
4	11KV Pillar Box Details	02
5	Indicative SLD	01

VILLAGE RAIDIHI
TOWNSHIP (150 ACRES) (COMBINED FOR DSTPP & DULANGA CMP)
FOREST LAND
GREEN BELT
THIS AREA IS NOT LEVELLED
FABRICATION YARD
BHEL OFFICE, STORAGE YARD AND SHED
VILLAGE DARLIPALI
EXISTING 33KV/11KV CPS
SPACE FOR SWYD BAY
11KV SOURCE
BATCHING PLANT AREA
FABRICATION YARD
BATCHING PLANT AREA
PROPOSED RESERVOIR
STP
VILLAGE ALLIPARA
VASUNDHARA NALA
OVERHEAD CABLE IN TRESTLE 3CX185SQMM
OVERHEAD TRANSMISSION LINE/ RING NETWORK
WIND ROSE (JHARSUGUDA)
NOTES:
LEGEND:
STAGE-II (1X800 MW) FOR NIT PURPOSE
NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION
PROJECT
DARLIPALI SUPER THERMAL POWER PROJECT
(2x800 MW+1x800 MW)
TITLE
GENERAL LAYOUT PLAN
28.02.24
16.01.24
APPD
DATE
SIZE A0
SCALE 1:4000
9551-999-POC-F-001
REV. NO. B



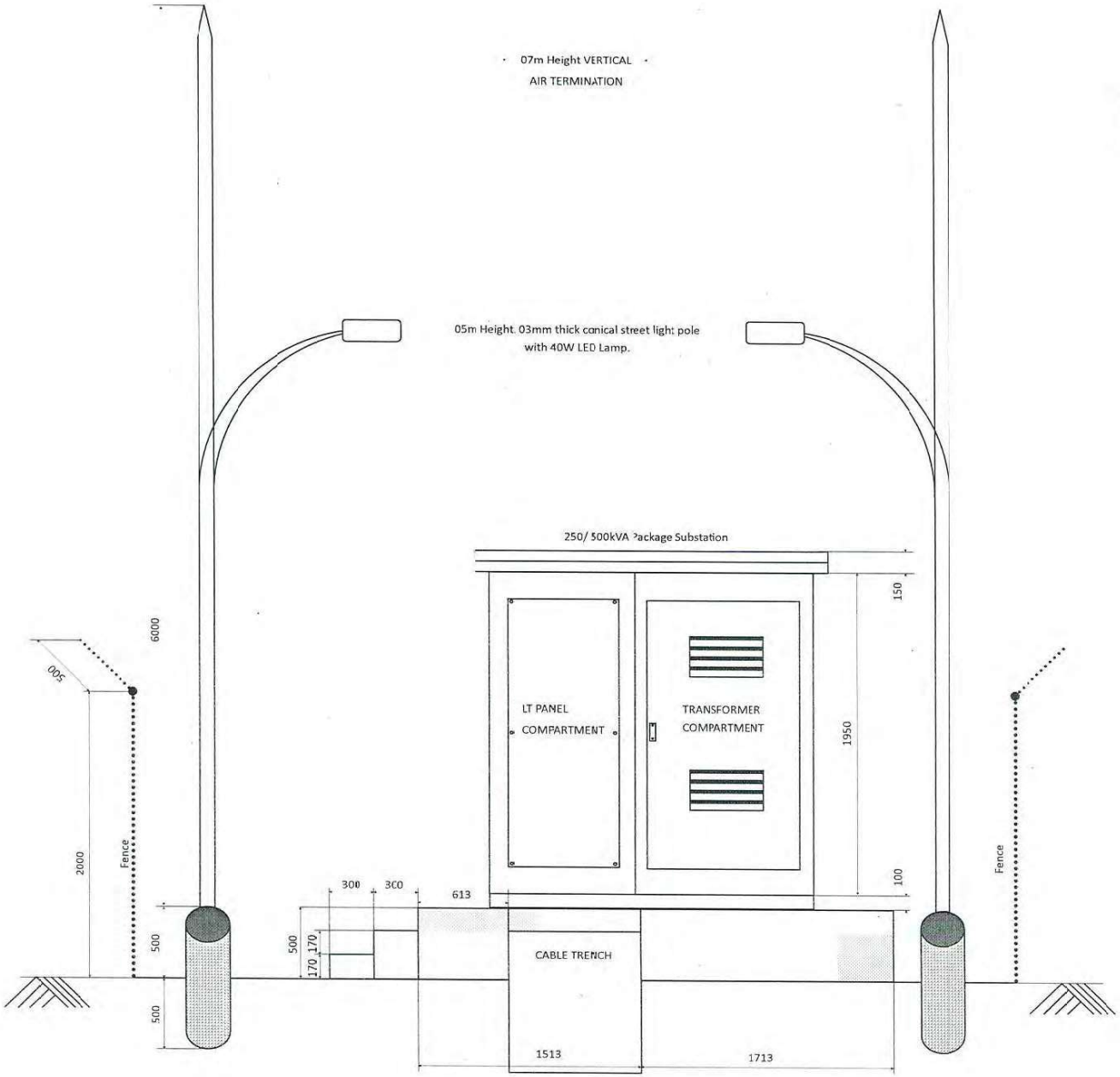
LEGEND

S. No.	Symbol	Description
1		3.15mm GI chain linked wire Fence
2	N E	Neutral Earthing Pit
3	B & L	Body & Lightning Earthing Pit
4		Earthing Strips
5		7 meter Vertical Air Terminations
6		5m height, 3mm thick conical GI street light pole with 40W LED light.
7		Treated Earth Pit 3m, 50mmø GI Earth Electrode.

NOTE:

1. The Neutral Earth Pit will not be connected to the B&L Grid (Body and Lightning Grid).
2. Light Poles will be earthed with 8 SWG wire.
3. Fence will be earthed using 25x3mm GI flat.
4. Vertical Air Termination and Body Earthing shall be done by 50x6mm GI Flat.
5. Neutral earthing of transfomer via 50x6mm GI Flat.
6. 11kV Earth Clearance of 2750mm shall be maintained as per Indian Electricity Rules.
7. 04 Nos. of 10 litres capacity each Fire Bucket shall be kept adjacent or inside the Substation.
8. Aluminium Alloy 5kg CO_2 Fire Extinguisher shall be kept adjacent or inside the Substation.
9. All the four sides of the substation fence shall have "11kV DANGER" board sign—06 Nos. in total.
10. Foundation drawings of PSS are indicative and actual to be incorporated.

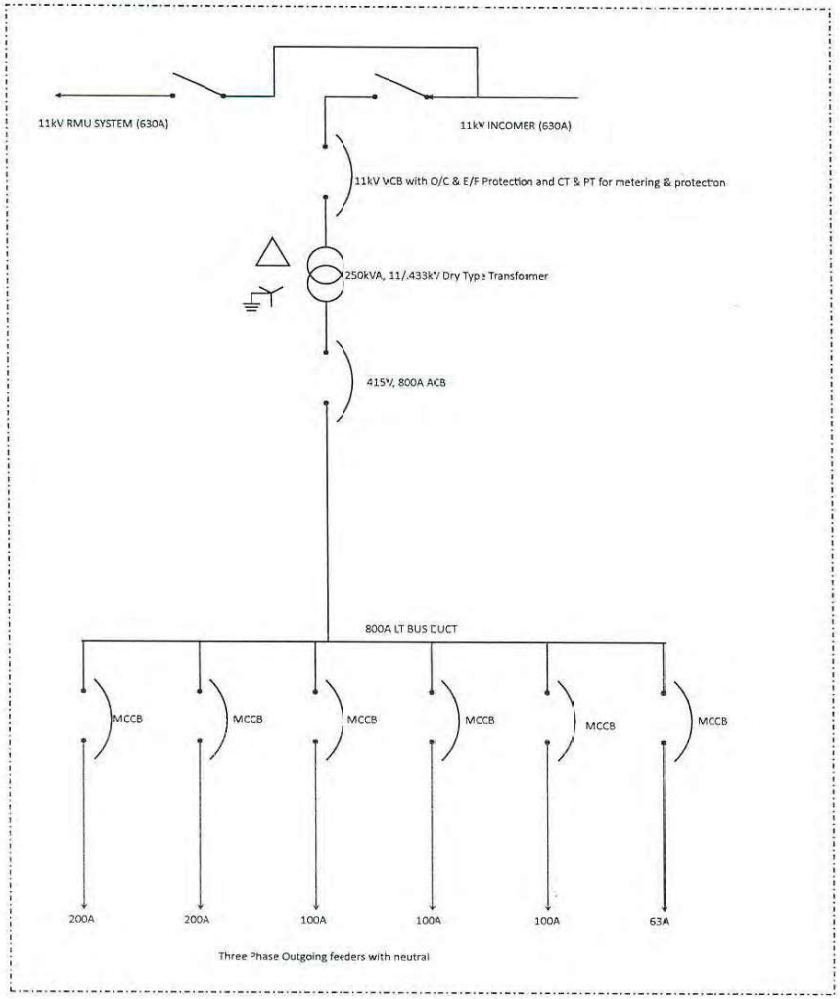
PROJECT	CONSTRUCTION POWER STANDARD	
CUSTOMER	BHEL	BHARAT HEAVY ELECTRICALS LIMITED
TITLE	250/500 kVA PACKAGE SUBSTATION — PLAN	
DRAWING NO.:	BHEL-CP-STND-02	SHEET NO. 01 OF 01



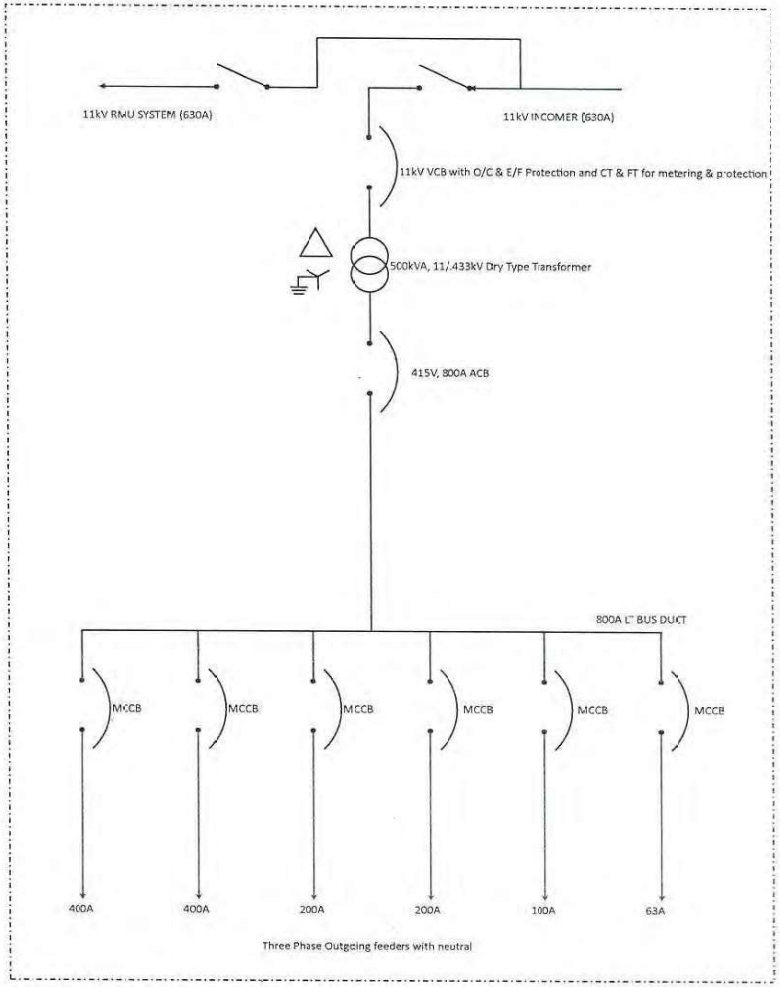
NOTE:

1. Dimensions are in mm unless stated otherwise.
2. PSS dimensions & Foundation drawings are indicative and actual to be incorporated.

PROJECT	CONSTRUCTION POWER STANDARD
CUSTOMER	BHARAT HEAVY ELECTRICALS LIMITED
TITLE	250/500 kVA PACKAGE SUBSTATION — SIDE VIEW
DRAWING No.:	BHEL-CP-STND--03 / SHEET NO. 01 OF 01



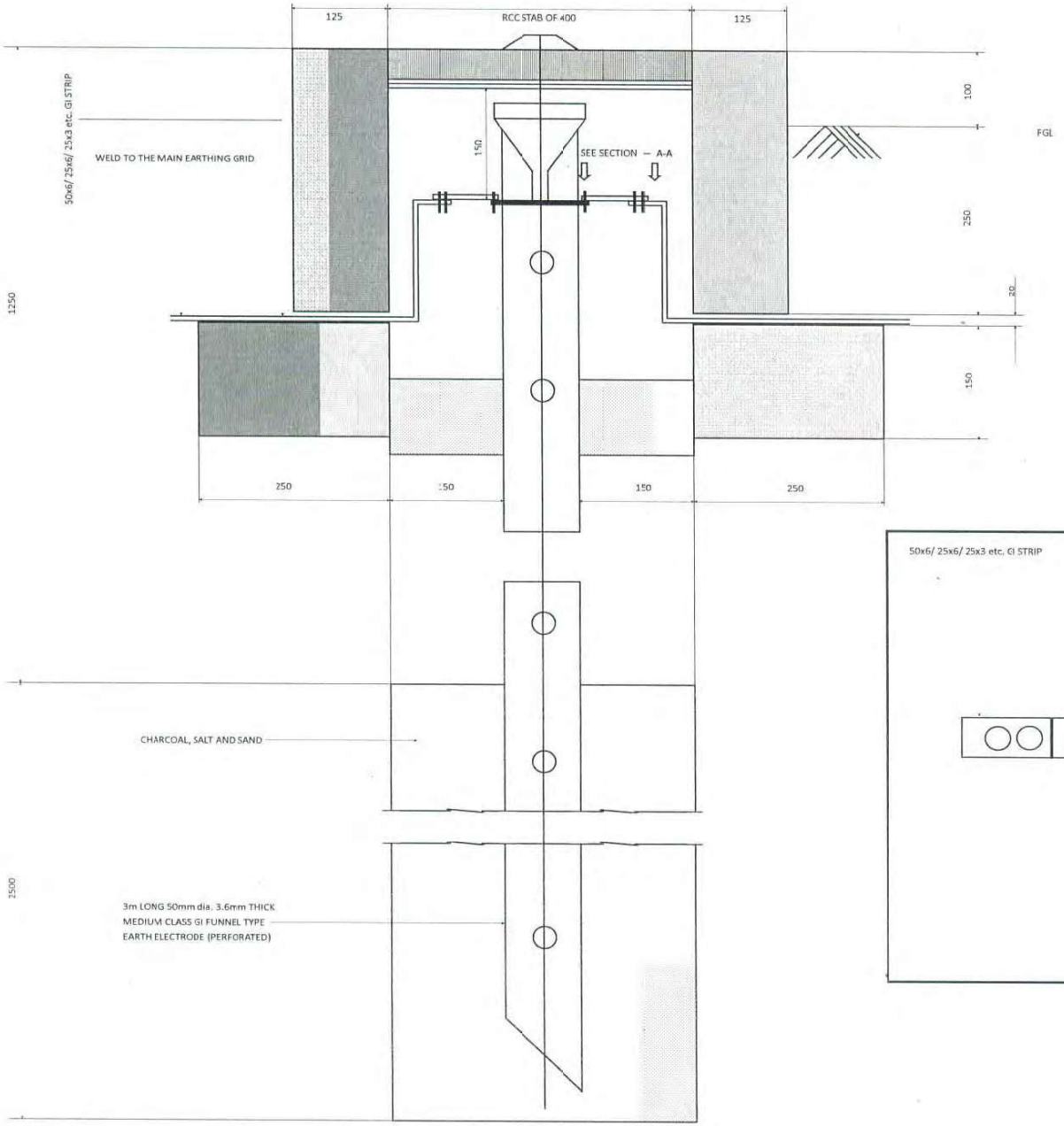
Single Line Diagram of 250kVA Package Substation

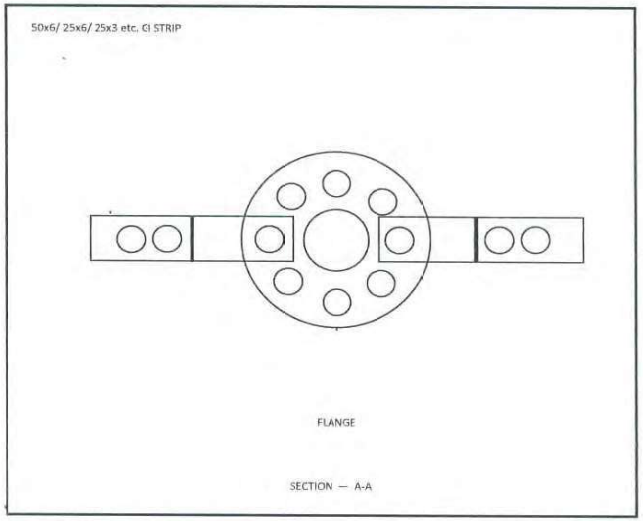


Single Line Diagram of 500kVA Package Substation

LEGEND	
—/—	Air Break Manual Operated Isolators
:)	Vacuum/ Air Circuit Breaker
⊖	Transformer

PROJECT	CONSTRUCTION POWER STANDARD	
CUSTOMER	BHEL	BHARAT HEAVY ELECTRICALS LIMITED
TITLE	SINGLE LINE DIAGRAM OF PACKAGE SUBSTATION	
Drawing No.:	BHEL-STND-CP-04	SHEET NO. 01 OF 01



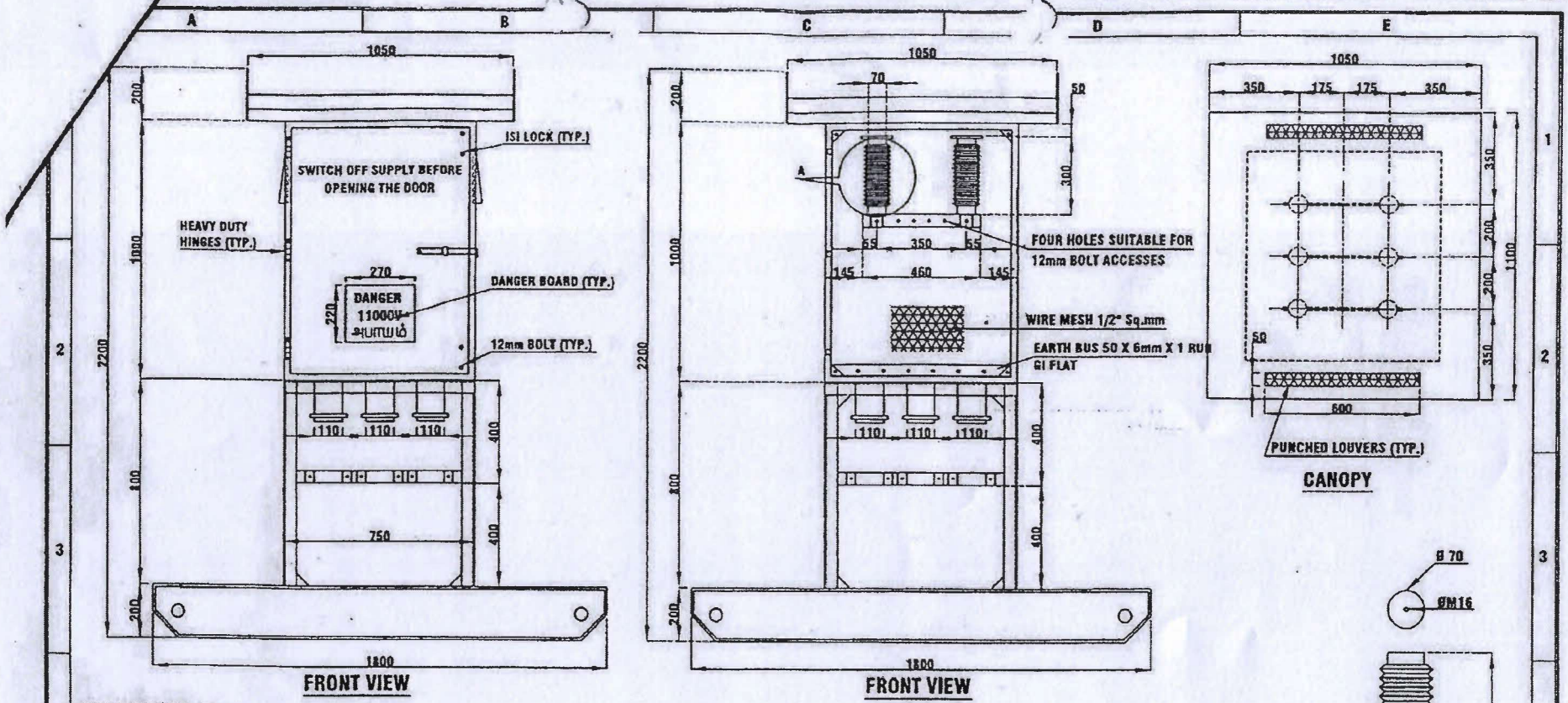


NOTE:

1. The Earth Pits shall be in line with Latest amendments of IS: 3043 .
2. Section — A-A: Refers to the perforated GI pipe with flange for earthing conductor connections via NUT & BOLTS.
3. All measurements are in mm.

PROJECT	CONSTRUCTION POWER STANDARD		
CUSTOMER		BHARAT HEAVY ELECTRICALS LIMITED	
TITLE	CONSTRUCTION POWER EARTH PITS		
Drawing No.:	BHEL-S'ND-CP-05		SHEET NO. 01 OF 01

GENERAL ARRANGEMENT DIAGRAM OF FRONT VIEW FOR 11KV 630A PILLER BOX.



SHEET THICKNESS : 2.5mm
BOTTOM PLATE THICKNESS : 4mm

PAINTING

PILLAR BOX SHOULD BE GIVEN PRIMARY COAT OF ZINC CHROMATE OR ZINC DUST AND TWO COATS OF ENAMEL PAINT OF GOLDEN YELLOW SHADE. INTERIOR SHOULD BE GIVEN ENAMEL PAINT OF GOLDEN YELLOW. PAINTING SHOULD BE GIVEN AFTER PRETREATMENTS AND PHOSPHATING.

NOTE:

1. ALL THE BOLTS NUTS USED IN THE PILLAR BOX AT ANY PLACE SHOULD BE OF SIZE 12mm ONLY
2. FOR CABLE TERMINATION M.S. CADMIUM COATED, BOLTS & NUT PROVIDED ON THE BUS BAR SHOULD BE OF SIZE M12 X 50mm ONLY.
3. CAUTION TO BE PAINTED ON BOTH THE DOORS IS GIVEN AS BELOW:
"SWITCH OFF SUPPLY BEFORE OPENNING THE DOOR"
THIS SHOULD BE PAINTED IN ENGLISH AND ITS EQUIVALENT IN TAMIL ON BOTH THE DOORS.

BUS BAR:

SIZE SHOULD BE 50mm X 10mm X 460mm
ELECTRLYTIC GRADE COPPER.
EARTH BUS SHOULD HAVE 4 NOS. OF EQUALLY SPACED HOLES SUITABLE FOR 12mm BOLTS.

LABLE:

FOR PANEL KEY OPERATION "OPEN-CLOSE" DIRECTIONAL ARROW MARKING SHOULD BE PAINTED ON DOOR

TOLERANCE FOR UNTOLERENCED DIMENSION

BASIC SIZE	TOLERANCE
0-100mm	±2mm
101-600mm	±5mm
601-1200mm	±10mm
1201-2000mm	±15mm
2001-3000mm	±20mm
3001 AND ABOVE	±25mm