

# ODISHA POWER TRANSMISSION CORPORATION LIMITED



**Package CPC-73/2014-15:**

Construction of 220kV Double Circuit Transmission line on DC tower from 220/132/33KV Grid S/S Aatri(Karadagadia) to Pandiabil 400/220 KV Grid S/S (Benapanjari) of PGCIL (Appx. Line Length: 24.0 Kms) on Turnkey basis” in e- tendering mode only.

## **VOL-IIA**

### **SCOPE OF WORKS**

**NOTICE INVITING TENDER-NIT NO. CPC-73/ 2014-15**

**TENDER SPECIFICATION NO:**

**Sr.G.M- CPC-TENDER- PACKAGE- 73/2014-15**

## **IMPORTANT NOTE**

**THE BIDDERS ARE ADVISED TO VISIT THE SITE BEFORE QUOTING THE BID. THEY SHALL ASCERTAIN ALL THE DATA FOR TURNKEY COMPLETION OF THE SUBSTATION AND ASSOCIATED TRANSMISSION LINES SUCH AS:-**

- 1. SOIL BEARING CAPABILITY.**
- 2. BENCHING AND FILLING FOR SITE LEVELLING.**
- 3. TYPE OF STRUCTURES FOR BOTH LINE & SUBSTATION.**
- 4. QUANTITY OF MATERIALS/STRUCTURES/EQUIPMENT.**
- 5. TYPE OF FOUNDATIONS FOR LINE TOWERS & SUB STATION EQUIPMENT/STRUCTURES.**
- 6. THE LENGTH OF THE BOUNDARY WALL, FENCING AND ROADS.**
- 7. ANY OTHER DATA REQUIRED FOR DESIGNING THE LINE & SUBSTATION.**

## **SCOPE OF WORK:-**

### **1. General**

The Employer OPTCL (M/S ODISHA POWER TRANSMISSION CORPORATION LIMITED) is strengthening their Transmission and Distribution systems by way of constructing the following sub-station & bay extensions at Sub-station, Transmission line & associated system at different location in Odisha.

### **Package CPC-73/2014-15:**

Construction of 220kV Double Circuit Transmission line on DC tower from 220/132/33KV Grid S/S Aatri(Karadagadia) to Pandiabil 400/220 KV Grid S/S (Benapanjari) of PGCIL (Appx. Line Length: 24.0 Kms) on Turnkey basis” in e- tendering mode only.

The works are to be carried out on Turnkey Basis till final commissioning of substation bay extension and associated line, its testing, commissioning and handing over the same to the owner.

### **The scope of the work includes:-**

- (i) Bidders are requested to visit the site before quoting the bid. The scope of work is not limiting to the respective bidding proposal sheet (BPS, Price schedule).
- (ii) In Case any work, which is not included in the BPS, but required for completion of project, to be decided mutually, considering OPTCL rate contract rates.
- (iii) The scope of materials/equipment is not limiting to respective BPS. In case any material /equipment is not included, but required for the project, to be decided mutually agreed rates.
- (iv) Design, manufacture, testing, supply & commissioning of all equipment for substation bay extension, conversion of S/C line to D/C & associated system, as detailed in the specifications and schedule of quantities and in subsequent.
- (v) Execution of all civil works as per schedule for erection of Tower column (S/S), Tower(Line), equipment foundation(S/S), construction of earth mat, cable trench, drainage system, Fencing etc.
- (vi) Erection, testing, commissioning of all equipment and handing over of the substation bays complete in all respect as per approved scheme and to the satisfaction of the Employer including statutory inspection.
- (vii) The makes of the equipment/components/materials shall be from OPTCL approve vendor list indicated in this tender and to be approved by the employer before placement of the order on the vendor/manufacturer.
- (viii) The contractor(s) shall arrange power supply for construction of the project. The expenditure for such arrangement till completion of the project shall be to the contractor(s) account.
- (ix) The contractor(s) shall arrange clean water for construction and curing to the civil works.
- (x) The work as mentioned in the price schedule shall be considered for the evaluation of the bid.
- (xi) The contractor shall arrange for security of all the materials including owner supply materials (handed over to him) that are required for successful completion of the project till final handing over of the entire work to OPTCL.
- (xii) Contractor has to obtain Project License in respect of the projects from the Secretary, Electrical Licensing Board of Orissa at his own cost, prior to commencement of works.
- (xiii) The contractor shall supply one official copy of each **Standard** listed in the appropriate schedule.

The contractor shall be fully responsible for providing all equipment, material, systems and services which are required to complete the construction and successful commissioning of the works in all respects excepting those specifically excluded under the clause “1.2 - Specific exclusions” in the chapter “General Clauses”. The Contractor shall also refer to the Technical Specification (Vol.-II), for proper understanding of the works involved in respect of each substation.

The scope of work on Turnkey basis includes design, engineering, manufacture, type testing, (factory testing) supply on FOR destination site basis, transportation, handling, storage at site, erection, site testing, commissioning complete in all respects and maintenance of plant and equipment until handing over of works in accordance with Conditions of Contract and the stipulations under various chapters of this specification at the prices stated in the Price Schedule for the following.

## 2.0 BRIEF SCOPE OF WORK:-

### (I) Package CPC-73/2014-15:

|       |  |
|-------|--|
| i)    | Supply of all equipment & materials for the transmission line  |
| ii)   | Detailed design of the line.   |
| iii)  | Providing engineering data and drawings, as per specified format, for employer’s review, approval and records.   |
| iv)   | Complete Manufacturing including Type, Acceptance & Routine testing, as specified.   |
| v)    | Packing and transportation from the manufacturer’s works to the site including transit insurance & customs clearance/ port clearance (if required), port handling, clearance for imported goods and further loading (if applicable)” As delivered at site basis”   |
| vi)   | Receipt, Unloading, Storage, Insurance and Preservation of Sub-station & Transmission Line equipment,material & accessories at site.   |
| viii) | <p><b>Name of the work: Construction of 220kV Double Circuit Transmission line on DC tower from 220/132/33KV Grid S/S Aatri(Karadagadia) to Pandiabil 400/220 KV Grid S/S (Benapanjari) of PGCIL (Appx. Line Length: 24.0 Kms)</b></p> <p>(1) Transmission Line route survey of entire stretch, Settlement of all issues related to right of Way and construction of line (including supply, erection &amp; all civil works).<br/> (2) Testing and commissioning of Transmission Line &amp; accessories.<br/> (3) Handing over of the completed system to the Owner.</p> |
| ix)   | (4) Satisfactory conclusion of the Contract.   |

\*\*\* The aforesaid scope of work is only indicative. The detailed BOQ (Bill of Quantity) is described in the Bidding Proposal Sheet (Price schedule), which are available in [www.tenderwizard.com/OPTCL](http://www.tenderwizard.com/OPTCL), as per details schedule given below:

\*\*\*\* ~~The price bid & techno-commercial bid uploaded are in pdf for the reference of the bidders. However, the same will be finalized and uploaded after the pre bid conference.~~

\*\*\*\*\* **Important Instruction:** Wherever, bay extension works are involved the bidder should take care to match with the existing system for aesthetic view. Bidder should visit the site before participating in the tender.

## 2.1. Substation

### 2.1.1. Electrical

The scope includes but is not limited to

#### i) Supply erection, testing & commissioning of the following equipments:

- a) Circuit breakers
- b) Isolators
- c) Current transformers.
- d) Voltage transformers (capacitive and inductive)
- e) CT, IVT console boxes with aluminium alloy having minimum three mm thickness.
- f) All out door kiosks/boxes, shall be GI sheet of minimum 2mm thickness with aluminium alloy *canopy* (rain hood) of 3mm thickness.
- g) Surge arresters
- h) Post insulators
- i) Protection, control, and metering systems
- j) Insulator strings with hardware
- k) Busbar, circuit conductor and all conductor accessories. Other interconnection shall be through Moose ACSR.
- l) Power and control cables, cabling accessories, cable trays etc. Proper sealing of the cable entry (control & Power) at Control Room building, to prevent water entering from switch yard/outside to CR Building, preventing entry of rats and reptiles, Fire proof etc.
- m) AC/DC systems including all distribution boards, battery and charger systems, auxiliary transformers.
- n) Air conditioning plant and systems for control room
- o) Fire fighting systems and equipment
- p) Steel structures for switchyard gantries and portals (lattice type); and equipment (pipe or lattice type) including those for lightning protection.
- q) Earthing system and earthing conductors.
- r) Testing and maintenance equipment.
- s) Lighting of substation area and substation buildings. Illumination and emergency lighting system at different locations.
- t) Control and relay panels as proposed.
- u) Event logger panel.(for 220/132/33 KV Sub-station): NA in this Package.
- v) AC and DC distribution boards as per requirement and as proposed.
- w) Bus bar protection scheme (for 220kV bus only).
- x) Disturbance recorder with Time synchronization. (GPS)

- y) Sub station level PC/Lap top provision for Relay configuration with their software.
- z) Any other items required for completion of the project are also in the scope of this contract in order to complete the sub-station in all respect.
- aa) Supply of all clamps, connectors and hardware required for commissioning of the substation. The quantity and rating of the connectors and clamps are dependent on the layout and requirement of the substation.
- bb) Supply and putting of sub-station illumination system. All the light fittings shall be LED type & these fittings shall be mounted on switch yard portal structures such as columns & beams. No separate lighting mast is required. Entire substation lighting system in the switch yard & colony shall be designed using underground cables only. No over head conductors are permitted for this purpose. For street lighting one outdoor lighting kiosk with two incomers of 200A rating switch fuse units (SFU) & with six feeders of 32A rating fitted with MCB shall be considered. Similar type of outdoor kiosk shall be considered for colony power supply with 200A SFU & ten out-going feeder of 32A rating fitted with MCB shall be considered.

**ii) Erection, testing & commissioning of the following equipment :(Owner supply materials/equipment)**

1. Power transformers /auto transformers

**iii) Supply of the following equipments:**

1. Mandatory spares for substation equipment being supplied under this contract as per Bid proposal Sheet ( BPS) **schedule-2A**.
2. Maintenance & testing equipment etc as per the list provided in relevant chapter of technical specifications.

**2.1.2. Civil works**

The design, engineering, supply of all materials including cement and steel, consumables, as per specification and approved drawings for civil works of the substation including but not limited to the following:

1. Designing, fabrication, galvanizing and erection of structures on respective foundations detailed in specification for civil works. Supply of all structural materials (columns & beams, hardware & fasteners etc) as per requirement. The contractor shall preferably adopt OPTCL designed standard structures for use in various substation, the details of which are given at “**Clause no 12**” of this chapter.
2. Soil testing for soil resistivity and soil bearing capacity before designing.
3. Site development including leveling, filling & compacting of the sub-station area to the desired height.

4. Wherever pile foundations are required for Control room building, switch yard tower columns, Equipment foundation and transmission line towers etc., these are to be constructed as per the guideline indicated in the specification elsewhere. The type of pile foundations can be ascertained only after soil investigation and approval of the same by OPTCL.
5. Construction of sub-station retaining wall with brick masonry and fencing by GI heavy-duty goat mesh fencing as per site requirement.
6. Construction of boundary wall along the property line of the substation with Main gate, security shed and two nos. switch yard gates in the sub-station. Provisions of a security shed near the main gate. The structure shall be RCC framed structure. There shall be provision of electrical illumination facilities.
7. Fencing of switch yard area and other areas like station transformer area.
  8. There shall be provision of plantations of fruit bearing plants and water tap provision for watering the plants in the sub-stations.
  9. Construction of all foundations for columns, all switchgear such as circuit breakers and isolators, CT's, CVT's and other substation equipment such as line traps, post insulator, etc.
  10. Construction of foundation of transformer including supply and putting of rail from the service bay to the transformer plinth, all foundations of columns, equipment structures. Separate foundations for the marshaling boxes of the isolators are to be considered.
  11. Anti termite treatment of switch yard and colony buildings.
  12. Switch yard buildings such as control room, DG set room and. There shall be provision of a water cooler including water purifier inside the control room building. Provision of split type air conditioners inside the control room & PLCC room of Control Room building and conference area.
  13. There shall be provision of store shed, one Ramp with winch for lifting the materials and lowering the materials up to 5 MT and open yard platform to store the materials like transformer bushing, CT, CVT and other equipment.
  14. Supply and spreading of uniform 20mm nominal size HG metal of 160mm thick inside the switch yard area of the Sub- Stations. The spreading will be done above a finished level of switchyard land by plain cement concrete of thickness 75 mm (ratio 1:4:8). Anti weed treatment of the switch yard area to be made as per prevailing practice before spreading of PCC.
  15. Construction of drainage system of the sub-stations and the newly constructed quarters & flood water discharge systems. Miscellaneous works like manholes soak pits, RCC trench, fencing, etc. in the switch yard.
  16. Construction of rainwater harvesting arrangements in the substation.
  17. Construction of cable trenches with trays & covers & sump pit with pump, as per requirement.

18. Construction of approach road to the new sub-station as per requirement. Construction of periphery roads inside the fencing. The roads inside the switch yard, at the periphery shall be of 3.75 mtrs wide & shall be of concrete road as per technical specification. The other roads main and approach road shall be 7 mtrs wide and the Main Road shall be of concrete & the approach road shall be of bitumen. Road in front of transformer shall be 7.0 mtrs wide concrete road.

19. Designing and providing the earth mat and earthing of the sub-station lighting protection, equipment earthing etc. Earth mat shall be designed using 75X10mm GI flat. For lightening protection individual earth spike (**GI pipe 50mm dia, heavy gauge**) of 9 mtrs long for 220 KV ,7 Mtrs long for 132 KV & 5 Mtrs long for 33 KV shall be provided on each column of the switch yard. Water tap provision shall be provided for pouring water into the earth pits constructed inside & around the periphery fence the switch yard. The earthing shall be extended beyond 2 **mtrs** from the fencing and the fencing earthing are also to be taken care.

20. 400 KV system shall have 40 mm dia MS rod for laying of earth mat & earth riser shall be with 75X10 mm HDG flat.

21. Civic amenities for the township including drainage and sewerage systems.

22. All other materials, which the contractor feels to be required for completion of the sub-station.

23. Plantation of fruit bearing and flower bearing plants and gardens in and around the sub-station.

24. Modular Multi-diameter flexible Cable sealing system consisting of frames, blocks and accessories to be installed wherever the electrical / control / communication cables over-ground enter or leave from control room building. Cable sealing to be done with Multi-diameter type flexible modular based sealing blocks of different sizes ( size 20: 4mm to 14.5 mm ,size 30 : 10mm to 25 mm ,size 40: 21.5mm to 34.5mm , size 60: 28mm to 54 mm , size 90: 48mm to 71 mm , size 120 : 67.5mm to 99 mm **or any convenient size** ) to be provided for simple, easy and quick to assemble & re-assemble. some spare blocks on the frame to be provided with usable Multi-diameter blocks with center plug, so that these spare blocks can be used for expansion in future for wide range of cables, solid blocks should not be used on frame. Cable sealing system should have been type tested for fire / water / smoke tightness and supplier shall have local presence by way of full infrastructure having service support, training support and stocks support and also have necessary sales support for any change / extension in future. Frames & stay-plate material should be galvanized steel and for compression single piece wedge with galvanized steel bolts should be used.

## **2.2. Transmission lines.**

### **i) Survey & ROW issues**

1) Detailed line Survey works as per specification.

2) The contractor shall have to solve the entire right of way problem at his own cost. Contractor shall also resolve the issues related to the tree cutting in the transmission line



and sub-station at his own cost. However the details of ROW issues have been indicated in Special Condition of Contract (SCC) –Vol.-1A.

ii) Design & Manufacturing (as applicable), supply, storage, erection, testing & commissioning of following materials

1. Galvanized Structural materials of towers as per requirement. OPTCL adopted standard towers shall preferably be used for the transmission line, the details of which is given at “Clause no.-13” in this chapter.
2. Insulators, hard wares.
3. ACSR conductors, GI earth wire with accessories etc and their stringing.
4. Commissioning of transmission lines.
5. Any other items required are also in the scope of this contract in order to complete the proposed transmission lines in all respect.

### iii) Civil works

The design, engineering, supply of all materials including cement and steel, consumables, as per specification and approved drawings for civil works of the Transmission line including all foundation and piling works but not limited to the following:

(a) Designing, fabrication, galvanizing and erection of structures on respective foundations detailed in specification for civil works. The contractor shall preferably adopt OPTCL designed standard tower structures for use in various transmission lines, the details of which are given elsewhere in this chapter.

(b) Soil testing for soil resistivity, type of soil and soil bearing capacity before designing.

### 3. Electrical System Data of 400/220/132/33

- |   |                     |
|---|---------------------|
| 1. Nominal System Voltage (KV)                        | 400/220/132/33      |
| 2. Highest System Voltage (kV)                        | 420/245/145/36      |
| 3. System Neutral Earthing.                           | Effectively earthed |
| 4. Basic Insulation Level (kVP)                       |                     |
| i) Bus  | 1425/1050/650/170   |
| ii) Equipment other than Transformer                  | 1425/1050/650/170   |
| iii) Transformer                                      | 1050/650/170        |
| 5. Power Frequency withstand voltage (KV rms)         | 520/460/275/80      |
| 6. System fault level KA                              | 63/40/40/25         |
| 7. Creepage distance for insulators (mm)              | 10500/6125/3625/900 |
| 8. Min. recommended clearance in air (mm) as per CBIP |                     |
| i) Phase-to-phase                                     | 3900/2160/1300/320  |
| ii) Phase-to-earth                                    | 3400/2160/1300/320  |
| iii) Sectional clearance                              | 6500/5000/4000/3000 |
| 9. Min. ground clearance (as per IE Rules)            | 8000/5500/5000/4000 |
| 10. Bus configuration for 400/220/132/33 kV           |                     |

Selection of ACSR conductor shall be Chosen from Moose, Zebra and panther as per requirement and decision of employer.

11. Phase-to-phase distance:
- |                       |                      |
|-----------------------|----------------------|
| i) Along the bay (mm) | 7000/4500//3000/1500 |
| ii) Strung bus (mm)   | 7000/4500/3000/1500  |
12. Reference design temperature
- 50 Deg. Centigrade.

Detailed technical particulars of different equipment have been specified in the respective specifications in the subsequent section. If any technical particulars are missed from this volume the same may please be referred from relevant IS: specification for bidding purpose.

#### **4. Design work**

The Bidder shall furnish detailed design of the substation & transmission lines. The design work shall include but not limited to technical calculations, preparation of drawings and bill of materials and specifying equipment not specified in the specification but necessary for the completion of the substation & transmission lines on the turnkey basis. The technical calculation design drawings, etc. shall be submitted to the Employer for approval. However the layout drawing furnished by OPTCL shall be taken as a guide line.

#### **5. Standards**

All materials and equipments shall generally comply in all respects with the latest edition of the relevant Indian Standards. International Electro-Technical Commission (IEC) or any other internationally accepted Standard equivalent or better than relevant Indian Standard. Equipment complying with all other authoritative standards such as British, ASA, VDE, etc. will also be considered if performance equivalent or superior to Indian Standard is ensured.

In the event of supply of equipment confirming to any International or internationally recognized Standard other than the Standard listed in the Specification. The salient features of comparison shall be brought out and furnished along with the bid.

In case of adopting any standard other than that IS or IEC, a complete set of adopted standard shall be supplied by the bidder. However it is desirable and preferred that the equipment offered shall comply with one consistent set of standard unless other than exceptional cases.

The equipment shall also comply with the latest revision of Indian Electricity Act and Indian Electricity Rules and any other Electrical Statutory Provision, Rules and Regulations.

#### **6. Reference Drawings**

Drawings showing indicating scope of work are enclosed. Drawings are complementary to specifications and shall be referred to for better understanding as well as for estimation of quantities and bill of materials for arising at lump sum bid price on turnkey basis.

The bidder shall submit with the tender, plan of the substation showing broadly the scope of work incorporated as per technical specification. All the drawings shall be submitted in

quadruplicate, enumerated in conformity with relevant clause stipulated in the Technical Section.

These drawings shall show proposed layout plan with section. Drawings showing overall dimension, clearance etc. required for assembling and dismantling and space requirements of all the apparatus are to be supplied to enable the Employer to examine the design and layout at the installation.

## **7. Packing and Marking**

The bidder shall include and provide for securely protecting and packing the plant so as to avoid damage in transit under proper condition and shall be responsible for all loss or damage caused by any defect in packing.

Large and heavy items such as 400kV, 220 kV, 132 kV and 33 KV equipment and structural steel shall be packed and shipped as per standard international practice.

Container/Carpoons, boxes, trunks and other packages shall be strong and sturdy in construction to withstand Ocean shipping, loading and unloading, transport on rough roads, and storage in tropical area and hauling and handling during erection etc. Boxes and packages shall also be protected by suitable packing with the help of wooden planks/MS frame or galvanized steel strips.

A layer of waterproof material shall be provided inside the cartoon/boxes/packages to protect the equipment from water seepage and to avoid rust.

The following information shall be marked on the container/boxes/packages etc.

- a. Contractor's/manufacturer's name, project title and contract reference.
- b. Plant/accessory identification No. and title.
- c. Net/gross weight.
- d. Employer's name with other dispatch particulars such as destination.

The employer shall take no responsibility for any damage done to the plant on route to the site of work or place of delivery whichever is applicable.

## **8. Tests**

i) Unless otherwise specified in respective section, all equipment shall be subjected routine, acceptance and type test as covered and specified in any standard in presence of the authorized representative of the employer.

ii) Bidder shall submit type test report from a recognized laboratory along with the bid.

iii) At least 15 days advance notice shall be given by the contractor to the employer for witness the tests.

## **9. Compliance to IE rule 1956**

i) The construction agency shall possess a safety manual duly approved by competent authority in the Govt. of his State Governing the safety in work by the personnel and staff.

ii) The agency shall possess valid contractor's license issued by the Electrical Licensing Board of Odisha (ELBO) failing which he will not be allowed to start the work.

iii) Supervisors of works shall possess appropriate valid supervisory certificate of competency issued ELBO, Odisha.

iv) At least 50% of electrical workmen employed in the project shall possess valid workmen permit by ELBO.

**10. The Contractor has to follow submission of drawings, data, and document as per the format given below.**

| SL No.                 | Description   | With Bids | Cost Order |             | Final Document |                    |            |
|------------------------|---|-----------|------------|-------------|----------------|--------------------|------------|
|                        |   |           | For Review | For Records | Transparency   | Prints (Photostat) | Electronic |
| <b>FOR SUB-STATION</b> |   |           |            |             |                |                    |            |
| 1.                     | Switchyard single line diagram                                    |           |            |             |                |                    |            |
| 2.                     | Switchyard layout, plan, section & placement of various equipment |           |            |             |                |                    |            |
| 3.                     | Switchyard earthing and lightning protection calculations.        |           |            |             |                |                    |            |
| 4.                     | Battery, battery charger, DCDB sizing calculations.               |           |            |             |                |                    |            |
| 5.                     | Switchyard lighting calculations                                  |           |            |             |                |                    |            |
| 6.                     | Switchyard earthing and lightning layout.                         |           |            |             |                |                    |            |
| 7.                     | Switchyard lighting layout.                                       |           |            |             |                |                    |            |
| 8.                     | Switchyard ,control room equipment and cable layout.              |           |            |             |                |                    |            |
| 9.                     | Switchyard clamps and connector details.                          |           |            |             |                |                    |            |
| 10.                    | Relay, metering and control panel block logic diagram.            |           |            |             |                |                    |            |
| 11.                    | Control panel schematic drawings.                                 |           |            |             |                |                    |            |
| 12.                    | Logic for castle key interlock between Breaker and isolator.      |           |            |             |                |                    |            |
| 13.                    | Relay, metering & Control panel and ACDB,DCDB GA drawings.        |           |            |             |                |                    |            |
| 14.                    | Switchyard equipment GA drawings and control schematics.          |           |            |             |                |                    |            |
| 15.                    | Cable schedule.   |           |            |             |                |                    |            |
| 16.                    | Interconnection diagrams.   |           |            |             |                |                    |            |
| 17.                    | Relay setting calculations and Coordination drawings.             |           |            |             |                |                    |            |
| 18.                    | SLDs of ACDB and DCDB.  |           |            |             |                |                    |            |
| 19.                    | Soak pit and waste oil pit layout and sizing calculation.         |           |            |             |                |                    |            |
| 20.                    | Structural design calculations super structures.                  |           |            |             |                |                    |            |
| 21.                    | Civil drawings for foundation and cable trenches.                 |           |            |             |                |                    |            |
| 22.                    | Structural fabrication drawings of equipments gantries etc.       |           |            |             |                |                    |            |

| SL No. | Description  | With Bids | Post Order |             | Final Document |                    |            |
|--------|--|-----------|------------|-------------|----------------|--------------------|------------|
|        |  |           | For Review | For Records | Transparency   | Prints (Photostat) | Electronic |
| 23.    | Filled in equipment data sheets as per enclosed format.  |           |            |             |                |                    |            |
| 24.    | Complete literature, leaflets for all equipments.  |           |            |             |                |                    |            |
| 25.    | Operational/maintenance manual.  |           |            |             |                |                    |            |
| 26.    | Deviation schedule w.r.t.<br>a) Specification<br>b) Document/ attachments.                         |           |            |             |                |                    |            |
| 27.    | List of spare parts foreach major equipment.   |           |            |             |                |                    |            |
| 28.    | List of special tools and tackles.   |           |            |             |                |                    |            |
| 29.    | List of sub-vendors.   |           |            |             |                |                    |            |
| 30.    | QA plan of vendor  |           |            |             |                |                    |            |
| 31.    | Installation operating and maintenance instruction.  |           |            |             |                |                    |            |
| 32.    | Inspection Plan and Testing Procedure.   |           |            |             |                |                    |            |
| 33.    | Test Records.  |           |            |             |                |                    |            |
| 34.    | List of commissioning/maintenance spares.  |           |            |             |                |                    |            |
| 35.    | Data Book/Manual<br>a)Installation Manual<br>b) Operating/Maintenance.<br>c)Catalogues/ Brochures. |           |            |             |                |                    |            |
|        | <b>FOR TRANSMISSION LINE</b>   |           |            |             |                |                    |            |
| 36     | Route map, Line Survey report(preliminary & Final) as per the BPS.                                 |           |            |             |                |                    |            |
| 37     | Soil Investigation report of the locations   |           |            |             |                |                    |            |
| 38     | Civil drawings for foundation of Tower & Foundation design   |           |            |             |                |                    |            |
| 39     | Structural design calculations super structure for Tower and detail drawings.                      |           |            |             |                |                    |            |
| 40     | Structural fabrication drawings of different type of towers.                                       |           |            |             |                |                    |            |
| 41     | Tower clamps & connector, insulator and other hardware materials details.                          |           |            |             |                |                    |            |
| 42     | Deviation schedule w.r.t.<br>a) Specification<br>b) Document/ attachments.                         |           |            |             |                |                    |            |
| 43     | List of special tools and tackles.   |           |            |             |                |                    |            |
| 44     | List of sub-vendors.   |           |            |             |                |                    |            |
| 45     | QA plan of vendor  |           |            |             |                |                    |            |
| 46     | Installation operating and maintenance instruction.  |           |            |             |                |                    |            |
| 47     | Inspection Plan and Testing Procedure.   |           |            |             |                |                    |            |
| 48     | Test Records.  |           |            |             |                |                    |            |

| SL No. | Description  | With Bids | Post Order |             | Final Document |                    |            |
|--------|--|-----------|------------|-------------|----------------|--------------------|------------|
|        |  |           | For Review | For Records | Transparency   | Prints (Photostat) | Electronic |
| 49     | List of commissioning/maintenance spares.  |           |            |             |                |                    |            |
| 50     | Data Book/Manual<br>a) Installation Manual<br>b) Operating/Maintenance.<br>c) Catalogues/ Brochures. |           |            |             |                |                    |            |

**11. Minimum clearance for substation design shall be as per details given in the table below.**

| Highest system voltage (kV) | Insulation level (kVP) | Switching Impulse Voltage (KVP) | Sectional Clearance (mm) | Minimum clearance      |                | Ground Clearance (mm) |
|-----------------------------|------------------------|---------------------------------|--------------------------|------------------------|----------------|-----------------------|
|                             |                        |                                 |                          | Between phase & Ground | Between phases |                       |
| 36KV                        | 170                    | -                               | 3000                     | 320                    | 320            | 3700                  |
| 145KV                       | 650                    | -                               | 4000                     | 1300                   | 1300           | 4600                  |
| 245KV                       | 1050                   | -                               | 5000                     | 2160                   | 2160           | 5500                  |
| 420KV                       | 1425                   |                                 | 7000                     | 3400                   | 3900           | 8000                  |

**TABLE 1 MINIMUM ELECTRICAL CLEARANCE  
FOR OUTDOOR SWITCHGEAR**

( Clause 2.1.9 )

| VOLTAGE<br>RATING<br>( HIGHEST<br>SYSTEM<br>VOLTAGE ) | IMPULSE WITHSTAND<br>LEVEL* | MINIMUM<br>CLEARANCE<br>TO EARTH† | MINIMUM<br>CLEARANCE<br>BETWEEN<br>PHASES | MINIMUM CLEARANCE<br>FROM ANY POINT<br>WHERE THE MAN<br>MAY BE REQUIRED<br>TO STAND TO THE<br>NEAREST UNSCREENED<br>CONDUCTOR IN AIR<br>( SECTIONAL CLEARANCE ) |
|---|-----------------------------|-----------------------------------|---|---|
| ( 1 )   | ( 2 )                       | ( 3 )                             | ( 4 )                                     | ( 5 )   |
| kV ( rms )  | kV ( peak )                 | mm                                | mm  | mm  |
| 12  | 60 ( List I )               | 90                                | 90  | 2 600   |
|   | 75 ( List II )              | 120                               | 120                                       | 2 600   |
| 36  | 145 ( List I )              | —                                 | 270                                       | 2 750   |
|   | 170 ( List II )             | 320                               | 320                                       | 3 000   |
| 72.5  | 325                         | 630                               | 630                                       | 3 500   |
| 123   | 450                         | 900                               | 900                                       | 3 500   |
|   | 550                         | 1 100                             | 1 100                                     | 4 000   |
| 145   | 450                         | 900                               | 900                                       | 3 500   |
|   | 550                         | 1 100                             | 1 100                                     | 4 000   |
|   | 650                         | 1 300                             | 1 300                                     | 4 000   |
| 245   | 650                         | 1 300                             | 1 300                                     | 4 000   |
|   | 750                         | 1 500                             | 1 500                                     | —   |
|   | 850                         | 1 600                             | 1 700                                     | 4 500   |
|   | 950                         | 1 900                             | 1 900                                     | 4 500   |
|   | 1 050                       | 2 400                             | 2 100                                     | 5 000   |

\*The impulse withstand levels are as given in IS : 2165-1977 Insulation coordination.. ( second revision ). For guidance regarding choice between List I and List II ( as in col 2 ) for rated voltages 12 kV and 36 kV and between levels against higher rated voltages, see IS : 2165-1977.

†The values of minimum clearance to earth are based on Table 6A of IS : 3716-1978 Application guide for insulation coordination.



## 12. OPTCL adopted standard switch yard structure:

The bidders may adopt their own type tested design for switchyard structures with approval from OPTCL. However the standard switch yard structures adopted in OPTCL switch yards system in different voltage levels are given below. The height & weight are indicative only.

|          |  |
|----------|--|
| <b>A</b> | <b>400 KV SIDE:</b>  |
| <b>1</b> | COLUMN: 4TA,4TB,4TC,4TD TYPE,- HEIGHT-29 (Additional Peak 5 Mtrs) MTRS, WEIGHT-10 MT |
| <b>2</b> | BEAM:4GA,4GB TYPE,-LENGTH- 27 MTRS, WEIGHT-4 MT                                      |
| <b>B</b> | <b>220 KV SIDE:</b>  |
| 2.       | COLUMN: P1S TYPE,- HEIGHT-21.5 MTRS,WEIGHT-4.464MT                                   |
| 3.       | BEAM:Q1 TYPE,-LENGTH-18 MTRS, WEIGHT-1.473MT   |
| <b>C</b> | <b>132 KV SIDE:</b>  |
| 6.       | COLUMN: T1S TYPE,- HEIGHT-15 MTRS,-WEIGHT-1.193 MT                                   |
| 7.       | COLUMN: T4S TYPE,-HEIGHT-11 MTRS,-WEIGHT-0.924 MT                                    |
| 8.       | BEAM:G1 TYPE,-LENGTH-10.4 MTRS,-WEIGHT-0.613 MT                                      |
| 9.       | BEAM:G2 TYPE,-LENGTH-14.9875 MTRS,-WEIGHT-0.906 MT                                   |
| 10.      | BEAM:G1X TYPE,-LENGTH-10.4 MTRS,-WEIGHT-1.370 MT                                     |
| 11.      | BEAM:G1,2 TYPE,-LENGTH-10.4 MTRS,-WEIGHT-1.25 MT                                     |
| <b>D</b> | <b>33 KV SIDE:</b>   |
| 1.       | COLUMN: T8S TYPE,- HEIGHT-10.5 MTRS,WEIGHT- 0.777 MT                                 |
| 2.       | COLUMN: T9S TYPE,-HEIGHT-7.5 MTRS,WEIGHT - 0.592 MT                                  |
| 3.       | BEAM:G4 TYPE,-LENGTH-5.5 MTRS,WEIGHT-0.306 MT  |
| 4.       | BEAM:G4X TYPE,-LENGTH-5.5 MTRS,WEIGHT-0.306 MT                                       |
| 5.       | BEAM:G6 TYPE,-LENGTH- MTRS,WEIGHT-7.25 MT  |
| <b>E</b> | <b>THE BAY WIDTH OF DIFFERENT VOLTAGE LEVEL ARE AS BELOW</b>                         |
| 1.       | 400 KV SYSTEM SHALL BE 27 MTRS.  |
| 2.       | 220 KV SYSTEM SHALL BE 18 MTRS   |
| 3.       | 132 KV SYSTEM SHALL BE 10.4/13.1MTRS.  |
| 4.       | 33 KV SYSTEM SHALL BE 5.5 MTRS   |

## 13. OPTCL adopted standard Tower structure for transmission line:

The contractor may adopt their own type tested design for transmission line structures/towers with approval from OPTCL. However the standard tower structures adopted in OPTCL for different voltage levels are given below. The height & weight are indicative only.

### A. 132 KV Transmission line.(Height 29 Mtrs) (MS Galvanised)

- (i) “PA” type: Unit weight: 3.430 MT.
- (ii) + 3 mtrs: Unit weight: 0.537 MT.
- (iii) + 6 mtrs: Unit weight: 1.349MT.
- (iv) “PB” type: Unit weight: 4.973 MT.
- (v) + 3 mtrs: Unit weight: 1.018 MT.

- (vi) + 6 mtrs: Unit weight: 2.104 MT.
- (vii) “PC” type: Unit weight: 6.214 MT.
- (viii) + 3 mtrs: Unit weight: 1.119 MT.
- (ix) + 6 mtrs: Unit weight: 2.342 MT.
- (x) Templates for PA- Unit weight: 0.665 MT
- (xi) Templates for PB- Unit weight: 0.602 MT
- (xii) Templates for PC- Unit weight: 1.904 MT

**B. 220 KV Transmission line.(Height 35.5 Mtrs) (MS Galvanised)**

- (i) “OA” type: Unit weight: 4.351 MT.
- (ii) + 3 mtrs: Unit weight: 0.727 MT.
- (iii) + 6 mtrs: Unit weight: 1.448 MT.
- (iv) “OB” type: Unit weight: 7.574 MT.
- (v) + 3 mtrs: Unit weight: 1.305 MT.
- (vi) + 6 mtrs: Unit weight: 2.242 MT.
- (vii) “OC” type: Unit weight: 9.839 MT.
- (viii) + 3 mtrs: Unit weight: 1.436 MT.
- (ix) + 6 mtrs: Unit weight: 2.599 MT.
- (x) +15 mtrs: Unit weight: 6.670 MT
- (xi) “UR” : Unit weight: 13.585 MT.
- (xii) “UR” + 3 mtrs type: Unit weight: 17.316 MT.
- (xiii) “UR” + 6 mtrs type: Unit weight: 4.249 MT.
- (xiv) Templates for OA- Unit weight: 0.597 MT
- (xv) Templates for OB- Unit weight: 0.815 MT
- (xvi) Templates for OC- Unit weight: 1.172 MT
- (xvii) Templates for UR- Unit weight: 1.509 MT

**C. 400 KV Transmission line Tower.(Height 46 Mtrs)(HT Steel in Leg Section, Cross Arm & Main Bracing and other Section MS)**

- (I) DA (Normal) Type:( 0 to 2 deg): 7.54869 MT
  - DA(+3 Mtr extn): +1.93856 MT
  - DA(+6 Mtr Extn): +2.74532 MT
  - DA(+9 Mtr Extn): +4.62562 MT
- (ii) DB Type:( 2 to 15 deg): 13.96342 MT
  - DB(+3 Mtr extn): + 2.44864 MT
  - DB(+6 Mtr Extn): +4.82572 MT

DB(+9 Mtr Extn): +9.34636 MT

(iii) DC Type:( 15 to 30 deg): 15.78074 MT

DC(+3 Mtr extn): +2.90732 MT

DC(+6 Mtr Extn): +5.4436 MT

DC (+9 Mtr Extn): +9.94816 MT

(iv) DD Type:(30 to 60 deg): 22.29494 MT.

DD(+3 Mtr extn): +4.11758 MT

DD(+6 Mtr Extn): +5.25294 MT

DD (+9 Mtr Extn): +7.2021 MT

**D. No. of Bolts & Nuts used in each of the Tower**

| Type of Tower | Normal | +3 mtrs | +6 mtrs | +9 mtrs |
|---------------|--------|---------|---------|---------|
| PA            | 1602   | 142     | 276     |         |
| PB            | 1097   | 273     | 542     |         |
| PC            | 1654   | 313     | 592     |         |
| OA            | 1147   | 180     | 228     |         |
| OB            | 1299   | 236     | 372     |         |
| OC            | 1877   | 254     | 402     |         |
| UR            | 2283   | 357     | 588     |         |
| DA            | 1980   | 524     | 722     | 1214    |
| DB            | 3668   | 656     | 1284    | 2464    |
| DC            | 4140   | 786     | 1442    | 2608    |
| DD            | 5844   | 1080    | 1388    | 1912    |

#### 14. Approved Make of Equipment & Materials to be used in the Sub-station and Transmission lines.

The following make of the equipment & materials shall be supplied as per approved vendor list.

| VENDOR LIST FOR SUBSTATION AND LINE WORKS OF OPTCL |  |   |
|--|--|---|
| Sl No  | Description of Equipment or material                 | Name of the Vendor  |
| 1  | BREAKER  |   |
| 1.1  | 400 KV Spring-Spring, SF-6, 3150A, 63KA              | Siemens/ABB/CGL/AREVA/BHEL  |
| 1.2  | 220 KV Spring-Spring, SF-6, 3150A, 40KA              | Siemens/ABB/CGL/AREVA   |
| 1.3  | 132 KV Spring-Spring, SF-6, 3150A, 40KA              | Siemens/ABB/CGL/AREVA   |
| 1.4  | 33 KV Spring-Vacuum, 1600A, 25KA                     | Siemens/ABB/CGL/AREVA/BHEL  |
| 2  | CT   |   |
| 2.1  | 400 KV ( Dead / Live Tank) & 220 KV (Dead tank/Live) | AREVA/ABB/CGL/BHEL/SIEMENS  |
| 2.2  | 132 KV, ( Dead / Live Tank)                          | AREVA/ABB/CGL/BHEL/VISHAL/TRANSFIELD/ INDIAN TRANSFORMER/VICTRANS/ VIJAYA ELECTRICALS/ MEHRUL ELECTRICAL & MECHANICAL ENGINEERS(P)LTD/KAPCO ELECTRIC (P)LTD |
| 2.3  | 33 KV, ( Dead / Live Tank)                           | AREVA/ABB/CGL/PRAGATI/VISHAL/TRANSFIELD / INDIAN TRANSFORMER /VICTRANS/ VIJAYA ELECTRICALS/ MEHRUL ELECTRICAL & MECHANICAL ENGINEERS/ KAPCO ELECTRIC (P)LTD |
| 3  | CVT  |   |
|  | 400KV, 220KV & 132KV                                 | AREVA/ABB/CGL/BHEL/SIEMENS  |
| 4  | PT / IVT   |   |
| 4.1  | 400KV & 220KV  | AREVA/ABB/CGL/BHEL/SIEMENS  |
| 4.2  | 132KV & 33KV   | AREVA/ ABB/ CGL/ BHEL/ INDIAN TRANSFORMERS / VIJAYA ELECTRICALS/ VICTRANS/ MEHRUL ELECTRICAL & MECHANICAL ENGINEERS/ KAPCO                                  |
| 5  | SURGE ARRESTOR                                       |   |
|  | 400KV, 220KV, 132KV & 33KV                           | CGL/OBLUM/ AREVA/ LAMCO/ ELPRO INTERNATIONAL  |
| 6  | CR PANEL   |   |
|  | 400KV, 220KV, 132KV & 33KV                           | ABB/SIEMENS/AREVA/OTHER MANUFACTURERS USING RELAYS OF SIEMENS/ AREVA/ABB/ SEL/ GE   |
| 7  | ISOLATORS (I) 400KV                                  | ABB/SIEMENS/SWITHEGEAR&STRUCTURALS/GR POWER/AREVA/CGL   |
|  | (II) 220KV, 132KV & 33KV                             | ABB/SIEMENS/SWITHEGEAR&STRUCTURALS/GR POWER/AREVA/CGL/ J.D Electrical Ltd/ PR ENGINEERING   |
| 8  | HARDWARE FITTINGS                                    |   |
| 8.1  | 400KV  | RASTRIYA UDHYOG/ ERITECH/ IAC/ EMI, KRSNA TRANSMISSION HARDWARE MFG PVT LTD/  |

|     |  |  |
|-----|--|--|
|     |  | INDUSTRIAL SPARE PRODUCTS. SUPREME & CO. PVT. LTD  |
| 8.2 | 220KV, 132KV & 33KV  | RASTRYAUDHYOG/ERITECH/IAC/EMI/ELECTRO TECH AND TRANSTECH, KRSNA TRANSMISSION HARDWARE MFG PVT LTD. JAINCO TRANSMISSION LTD, A.K.POWER INDUSTRIES PVT LTD./ INDUSTRIAL SPARE PRODUCTS/ SWAMIJI TRANSMISSION PVT. LTD/NIKE ENERGY MANUFACTURING PVT.LTD  |
| 9   | CONDUCTOR  | APAR, GPIL, ERITECH, STERLITE, VIJAYA/LUMINO/CABCON/TIRUPATI/ TERACOM/ KJV ALLOY   |
| 10  | EARTHWIRE  | BHARAT WIRE ROPES/UIC WIRES/USHA MARTIN /GK WIRE, BEDMUTHA INDUSTRIES  |
| 11  | DISC INSULATORS/SOLID CORE POST INSULATORS   | BHEL/WS/MODERN INSULATOR/ADITYA BIRLA INSULATORS/ SRAVANA, M/S INSULATORS & ELECTRICALS COMPANY, MANDEEP   |
| 12  | LONG ROD INSULATOR   | MODERN INSULATORS  |
| 13  | COMPOSITE POLYMER INSULATOR  | GOLDSTONE INFRATECH LTD/ DECAN ENTERPRISERS/ ADITY BIRLA INSULATOR   |
| 14  | TOWER & STRUCTURES FOR LINE AND SUBSTATION AND FOUNDATION BOLT (SAIL/TATA/RINL STEEL TO BE USED) | KEC/RPG/JYOTI /L&T/EMC/KALPATARU/ NEXO/UTKAL GALVANIZER/IVRCL INFRASTRUCTURES &PROJECTS LTD, NAGPUR/ UNIQUE STRUCTURES&TOWERS LTD BHILAI/TECHNO ENGINEERING &CO LTD NEW DELHI/UNISTAR GALVANISERS & FABRICATORS(P) LTD JAMSEDPUR/NEW MODERN TECHNO MECH PVT. LTD, BARIPADA / GLOBAL GALVANISER, KHURDA/ AGARWAL STEEL STRUCTURES (INDIA) PVT LTD, HYDERABAD/ SRI ASHUTOS ENGINEERING, RAIPUR/ ASTER PVT LIMITED, HYDERABAD/SHREEM ELECTRICALS PVT LIMITED, BANGALORE./ A.K.POWER INDUSTRIES/ VIJAY TRANSMISSION /GURUNANAK OVERSEAS/ SOLUX GALFAB /G.S.ENGINEERS |
| 15  | PVC INSULATED POWER AND CONTRAL CABLES   | NICCO/GLOSTER/CCI/KEI/CRYSTAL/POLYCAB/ GPIL/ FINOLEX/UNIVERSAL/M/S HAVELLS INDIA LTD/ KEC INTERNATIONAL LTD /DAKSHA INDUSTRIES /V-GUARD/ SCOT INNOVATION/ GEMSCAB/MOHTA ELECTRO SYSTEM(MESCAB)   |
| 16  | 132KV GRADE CABLE  | KEI INDUSTRIES LTD/ CABLE CORPORATION OF INDIA/ UNIVERSAL CABLE  |
| 17  | HF COAXIAL CABLES  | ALPHA COMMUNICATION, DELHI/DELTON CABLES, NEW DELHI  |
| 18  | STATION TRANSFORMER (BEE STANDARD)   | AREVA/ALFA/TESLA/OTPL  |
| 19  | FIRE FIGHTING EQUIPMENT  | MINIMAX/CEASE FIRE/ M/S KANADIA FYR FYTER PVT LTD./ASKA EQUIPMENTS LIMITED   |
| 20  | LIGHTING FIXTURES  | PHILPS/CGL/BAJAJ/HAVELS,AVNI SOLUTIONS PVT LTD.OTHER MAKE LED LIGHTING AS PER BEE STANDARD   |

|    |  |   |
|----|--|---|
| 21 | CEMENT OPC GRADE -43                                       | ACC/ULTRA TECH/KONARK/LAFARGE   |
| 22 | STEEL  | SAIL/TATA/RINL& STEELS OF OTHER MAKE TO BE APPROVED BY OPTCL AS & WHEN REQUIRED.  |
| 23 | GI PIPE  | TATA/JINDAL   |
| 24 | AIR CONDITIONER  | HITACHI/CARRIER/BLUE STAR/VOLTAS/LG   |
| 25 | PVC WIRES  | L&T/FINOLEX/ANCHOR/KDK/HAVELLS  |
| 26 | SWITCHES   | ANCHOR/ABB/CONA/INDO ASIAN/HAVELS   |
| 27 | MCB  | L&T/ABB/SIEMENS/MDS/ HAVELLS/INDO ASIAN   |
| 28 | ACB/MCCB   | L&T/SIEMENS/MERLIN GERIN  |
| 29 | ACDB/DCDB/BMK/CONSOLE BOX                                  | MAKTEL SYSTEM (VADODARA) /SARVANA (CHENAI)/<br>TECHNOCRAT (CUTTACK)/UNITED ENGINEERS /BOSE<br>ENGINEERING (INDIA) / ALFA AUTOMATION/ AMARA<br>RAJA/ CHHABI ELECTRICAL |
| 30 | CLAMPS AND CONNECTORS                                      | ELECTROMECH TRANSTECH/ RASTRA UDYOG<br>/TYCO/IAC /ASWINI KUMAR & CO.  |
| 31 | GI BOLTS & NUTS  | NEXO/ GKW/ ASP/ MAHESWARI (P) FASTENERS &<br>BRIGHT PVT. LTD  |
| 32 | 220V PLANATE BATTERY                                       | EXIDE   |
| 33 | 48V VRLA BATTERY   | EXIDE /AMARRAJA   |
| 34 | 220V DC BATTERY CHARGER                                    | STATCON POWER CONTROLS/ AMARRAJA/ CHLORIDE<br>INDIA (FORMERLY CALDYNE)  |
| 35 | 48V DC BATTERY CHARGER                                     | SIGNOTON(INDIA)/ CHLORIDE INDIA (FORMERLY<br>CALDYNE)/ STATCON POWER CONTROLS./ AUTOMATIC<br>ELECTRIC/ AMARRAJA   |
| 36 | WAVE TRAP  | AREVA/ ABB/ BPL   |
| 37 | DIGITAL PLCC WITH PROTECTION<br>COUPLER, FSK MODEM FOR VFT | AREVA/ ABB/ SIEMENS/ MAKE CONFIRMING TO IEC<br>STANDARD & COMPATIBLE WITH OPTCL SYSTEM  |
| 38 | EPBX   | BPL/SIEMENS/PUNCOM  |
| 39 | RTU  | ABB/ SIEMENS/ AREVA/ CHEMTROL MAKE CONFIRMING TO<br>IEC 870-5-101 PROTOCOL & COMPATIBLE WITH OPTCL<br>SYSTEM  |
| 40 | 220/132KV LINE TRAP  | AREVA/ABB/CGL/BPL/GYRO  |
| 41 | MEASURING INSTRUMENTS FOR TELECOM                          | ELECTRONICA/FLUKE/PHILIPS   |
| 42 | SPLITTER FOR CFE   | ALSTOM/CEGELAC  |
| 43 | STALLION MODULE FOR CFE<br>(PROPRIETARY)                   | STALLION TECHNOLOGIES INC. / ANY OTHER REPUTED<br>MAKE SUBJECT TO COMPATIBILITY WITH OPTCL SYSTEM.  |
| 44 | METERS, TRANSDUCERS, INDICATOR.                            | SECURE METERS PVT LTD   |
| 45 | AUXILIARY RELAYS.  | EAUSUN & REYORLEE LTD.  |
| 46 | SURVEY   | IDAX TESTING LAB. PVT.LTD/TECHNO SOCIETY OF<br>ENGINEERS FOR TECHNICAL SOLUTIONS / ALPHA TESTING<br>LABORATORY  |
| 47 | CONCRETE TESTING, PILE INTEGRITY<br>TESTING                | IDAX TESTING LAB. PVT.LTD   |
| 48 | MEGGER MAKE TESTING & MEASURING<br>INSTRUMENTS             | Megger LTD  |

**15. Portable Fire Extinguisher :****(ANNEXURE-I)****Portable fire extinguishers of the following types shall be supplied to each sub-station.**

| Sl No | Description of Items  | Unit | capacity  | Quantity Required |         |                      |      |               |         |
|-------|---|------|-----------|-------------------|---------|----------------------|------|---------------|---------|
|       |   |      |           | At 132/33 S/S     | each kV | At 220/132/33 kV S/S | each | At 220/33 S/S | each kV |
| 1     | Foam Type   | Nos  | 9 ltrs    | 2                 |         | 4                    |      | 4             |         |
| 2     | Dry chemical Powder Type (Trolley mounted)                                      | Nos  | 22.5 Kgs  | 2                 |         | 4                    |      | 2             |         |
| 3     | Dry Powder Type   | Nos  | 5 Kgs     | 2                 |         | 4                    |      | 2             |         |
| 4     | Carbon Dioxide (CO <sub>2</sub> )   | Nos  | 4.5K gs   | 5                 |         | 10                   |      | 5             |         |
| 5     | Carbon dioxide (CO <sub>2</sub> )Trolley mounted                                | Nos  | 22.5 Kgs  | 2                 |         | 4                    |      | 2             |         |
| 6     | Fire bucket with (a set comprises of six nos Bucket in each stand & one stand ) | Set  |           | 3                 |         | 5                    |      | 3             |         |
| 7     | 9 litre water type  | Nos  | 9 litre   | 4                 |         | 4                    |      | 4             |         |
| 8     | 50 Litres Mechanical Foam type  | Nos  | 50 Litres | 2                 |         | 2                    |      | 2             |         |

**The quantities are indicative. Bidders are advised to design as per the requirement.**

**16. Maintenance & Testing Equipment:****(ANNEXURE-II)**

**Maintenance & testing equipment shall be supplied & installed for each substation as per the list given below.**

| Sl. No | Description of Items   | Unit  | Quantity Required      |                           |                       |                       |
|--------|--|-------|------------------------|---------------------------|-----------------------|-----------------------|
|        |  |       | At each 400/220 KV S/S | At each 220/132/33 KV S/S | At each 220/33 KV S/S | At each 132/33 KV S/S |
| 1.     | 160 kv transformer oil breakdown voltage test set  | Nos   | 1                      | 1                         | 1                     | 1                     |
| 2.     | Insulation resistance tester (megger)  | Nos   | 1                      | 1                         | 1                     | 1                     |
| 3.     | Oil sampling bottle  | Nos   | 4                      | 4                         | 4                     | 4                     |
| 4.     | SF6 gas leak detector  | Nos   | 1                      | 1                         | 1                     | 1                     |
| 5.     | LCD, digital multimeter  | Nos   | 2                      | 2                         | 2                     | 2                     |
| 6.     | Analogue Multimeter(features same as digital multimeter)   | Nos   | 1                      | 2                         | 1                     | 1                     |
| 7.     | LCD, clamp on meter  | Nos   | 2                      | 2                         | 2                     | 2                     |
| 8.     | Digital earth tester   | Nos   | 1                      | 1                         | 1                     | 1                     |
| 9.     | Discharge rod as per standard for carrying out the switch yard maintenance work  | Nos   | 6                      | 6                         | 6                     | 6                     |
| 10.    | Rubber gloves of operation of isolators and earth switch   | Pairs | 2                      | 2                         | 2                     | 2                     |
| 11.    | Relay tools kit  | Sets  | 1                      | 1                         | 1                     | 1                     |
| 12.    | Portable emergency light   | Nos   | 4                      | 4                         | 4                     | 4                     |
| 13.    | Latest version desktop PC of reputed make with all its accessories including CPU, Monitor, UPS and having all latest loaded software and also its back up in shape of CD and separate pen drive . Suitable for loading of software as recommended by the relay manufacturer. It includes supply of one no portable laser printer of reputed make.<br>Make of PC and printer: HP/DELL | Set   | 1                      | 1                         | 1                     | 1                     |

\*\* The multimeters (both digital and analogue), clamp on meters, earth tester shall of “Fluke/Megger/Motwane” make. Prior approvals of OPTCL for all the testing equipments are to be taken.

\*\*\* Insulation resistance tester shall of M/S Megger .



## 17. Other Tools and Plants (T&P's) Requirement: (ANNEXURE-III)

Following T&P's of reputed make shall be supplied & installed at each substation.

| SI No | Description of Items   | unit | Quantity Required            |                                 |                                |                             |
|-------|--|------|------------------------------|---------------------------------|--------------------------------|-----------------------------|
|       |  |      | At each<br>400/220<br>KV S/S | At each<br>220/132/33<br>KV S/S | At each<br>220/33<br>KV<br>S/S | At each<br>132/33 KV<br>S/S |
| 1     | Set of "D" spanner(6mm – 42mm)   | Set  | 1                            | 1                               | 1                              | 1                           |
| 2     | Set of "Ring" spanner(6mm – 42mm)  | Set  | 1                            | 1                               | 1                              | 1                           |
| 3     | Socket wrench with sockets, handles, and other attachment(6mm-42mm)  | Set  | 1                            | 1                               | 1                              | 1                           |
| 4     | Insulated cutting plier  | Nos  | 2                            | 2                               | 2                              | 2                           |
| 5     | Insulated nose plier   | Nos  | 2                            | 2                               | 2                              | 2                           |
| 6     | Monkey plier   | Nos  | 1                            | 1                               | 1                              | 1                           |
| 7     | Circlip plier  | Nos  | 1                            | 1                               | 1                              | 1                           |
| 8     | Pipe wrench<br>a)12 inch – 1 no<br>b)18 inch – 1 no  | Set  | 1                            | 1                               | 1                              | 1                           |
| 9     | Sly wrench<br>a)12inch – 2 nos<br>b)18inch – 1 no  | Set  | 1                            | 1                               | 1                              | 1                           |
|       | Insulated handle screw drivers of different sizes as per required<br>a)12inch plain head – 2 nos<br>b)8inch plain head – 2 nos<br>c) 12inch star head – 1 no<br>d) small size6inch plain and star head – 2 each<br>e)Complete set of different head in one box/set -1set | Set  | 1                            | 1                               | 1                              | 1                           |
| 11    | "L"-N keys set of different sizes in one box/set   | Set  | 1                            | 1                               | 1                              | 1                           |
| 12    | M.S Files(12inch and 6inch sizes)<br>Round files and flat files-one each of different sizes)   | set  | 1                            | 1                               | 1                              | 1                           |
| 13    | Hammar with handle<br>a)1 lb – 2 nos<br>b)1/2 lb-2 nos<br>c)2 lb-1 no  | Set  | 1                            | 1                               | 1                              | 1                           |
| 14    | Crow bar<br>a)5 ft – 2nos<br>b)3ft-2 nos   | set  | 1                            | 1                               | 1                              | 1                           |
| 15    | Steel scale(12inch)  | Nos  | 2                            | 2                               | 2                              | 2                           |
| 16    | Steel tape<br>a)5 mtrs-2 nos<br>b)30mtrs-1 no  | Set  | 1                            | 1                               | 1                              | 1                           |
| 17    | Oil cane   | Nos  | 2                            | 2                               | 2                              | 2                           |
| 18    | Spirit level (8inch)   | No   | 2                            | 2                               | 2                              | 2                           |
| 19    | Plumb head with string and attachment  | No   | 1                            | 1                               | 1                              | 1                           |
| 20    | Maintenance safety belt with all attachment and helmets(complete one set)  | Set  | 3                            | 4                               | 3                              | 3                           |
| 21    | Hand drill machine with different bits and key.(Wolf make)   | No   | 1                            | 1                               | 1                              | 1                           |
| 22    | Vacuum cleaner having hot blower provision with all attachments (Eureka  | No   | 1                            | 1                               | 1                              | 1                           |

| SI No | Description of Items  | unit | Quantity Required            |                                 |                          |                        |
|-------|---|------|------------------------------|---------------------------------|--------------------------|------------------------|
|       |   |      | At each<br>400/220<br>KV S/S | At each<br>220/132/33<br>KV S/S | At each<br>220/33<br>S/S | KV<br>132/33 KV<br>S/S |
|       | Forbes make)  |      |                              |                                 |                          |                        |
| 23    | 230-250VAC,80W,450mm sweep,1400 rpm stand(rugged) FAN<br>Make: Almonard,CGL | No   | 4                            | 4                               | 2                        | 2                      |

\*\* T&P's shall be of Taparia/Geodre make. The hand drill and vacuum cleaner shall be wolf and Eureka Forbes make.

**18. Office Furniture:****(ANNEXURE-IV)**

Office furniture shall be supplied & installed at each substation as per the list given below. All the furniture shall be of Godrej make. Before supply of the furniture to the sub-station, approval from OPTCL is required. Details of the scope of supply are as indicated below.

| SI No | Description of Items   | unit | Quantity Required     |                           |                       |
|-------|--|------|-----------------------|---------------------------|-----------------------|
|       |  |      | At each 132/33 KV S/S | At each 220/132/33 KV S/S | At each 220/33 KV S/S |
| 1     | 5ftX3ft executive table with drawer both sides   | Nos  | 5                     | 6                         | 5                     |
| 2     | 3ftX2&1/2ft Table with one side drawer   | Nos  | 7                     | 8                         | 7                     |
| 3     | Computer table suitable keeping monitor, CPU,UPS and printer with two nos revolving arm chair suitable for computer use. | Set  | 1                     | 1                         | 1                     |
| 4     | Executive revolving ,adjustable (height) chairs with arm   | Nos  | 5                     | 6                         | 5                     |
| 5     | Cushion fixed “S” type steel chairs with arm   | Nos  | 18                    | 24                        | 18                    |
| 6     | 6ftX3ft conference table   | Nos  | 1                     | 1                         | 1                     |
| 7     | Cushion arm steel chairs for conference table purpose.   | Nos  | 6                     | 8                         | 6                     |
| 8     | 6ft height steel almirah (only with selves) for keeping records and other valuable items.                                | Nos  | 4                     | 6                         | 4                     |
| 9     | 6ft height steel almirah with glass doors for library purpose  | Nos  | 2                     | 2                         | 2                     |
| 10    | 6ft height (having minimum 6 lockers facility) steel cupboard with locking arrangement.                                  | Nos  | 2                     | 2                         | 2                     |
| 11    | 4ft steel rack (minimum three selves) for keeping the files and other items.   | Nos  | 8                     | 10                        | 8                     |

**19. PORTABLE ALUMINIUM LADDER EXTENDABLE TYPE OF 3m+ 3m TO BE USED FOR MAINTENANCE OF EQUIPMENT INSIDE SWITCH YARD.**

Heavy duty Two fold with sliding feature aluminum ladder to be used for the maintenance work equipment in the switch yard ( 400 KV,220 KV,132 KV & 33 KV: Breaker, CT, CVT, Isolators etc) & also street lighting maintenance. Each fold will be of minimum height of 3 Mtrs and should have better locking arrangement between each folds for better rigidity.

**20. PEDESTAL MOUNTED WHEEL FITTED DERRICK FOR LIFTING/ LOWERING OF MATERIALS UP TO 1.5 TON CAPACITY.**

Heavy duty Pedestal mounted wheel fitted derrick for lifting/ lowering of materials up to 1.5 ton capacity to be used for the maintenance work equipment in the switch yard (400 KV,220 KV,132 KV & 33 KV: Breaker, CT, CVT, Isolators etc) & also other maintenance works. The height of the derrick/platform will be suitable for lowering of the top pole of the circuit breaker up to 400 KV and other equipment upto 400 KV.

**END OF VOLUME-IIA (SCOPE OF WORK)**