



ODISHA POWER TRANSMISSION CORPORATION LIMITED

PACKAGE: CPC - 55/2022-23

Engineering, Supply, Erection, Testing and Commissioning of **2X20 MVA, 132/33 KV Grid Substation with SAS, Jharbandh at Sankri with associated 132 KV LILO Transmission line (Line Length- 8.705 Km)** on 132 KV Padampur-Nuapada DC line, at an Estimated Cost of the Package for Rs. 36.47 Crore in Bargarh district of Odisha on “Turnkey CONTRACT BASIS.

VOL-II-SECTION-I

SCOPE OF WORKS

NOTICE INVITING TENDER-NIT NO. CPC- 55/2022-23

**TENDER SPECIFICATION NO:
Sr. G.M- CPC- e-Tender- Jharbandh S/S – 55/2022-23**

IMPORTANT NOTE

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

- 1. THE LOCATION OF THE PROPOSED SITE FOR SUB-STATION AND ROUTE FOR TRANSMISSION LINE**
- 2. SOIL BEARING CAPABILITY.**
- 3. BENCHING AND FILLING FOR SITE LEVELLING.**
- 4. TYPE OF STRUCTURES FOR BOTH LINE & SUBSTATION.**
- 5. QUANTITY OF MATERIALS/STRUCTURES/EQUIPMENT.**
- 6. TYPE OF FOUNDATIONS FOR LINE TOWERS & SUB STATION EQUIPMENT/ STRUCTURES.**
- 7. LENGTH & TYPE OF THE BOUNDARY WALL, FENCING AND ROADS.**
- 8. ANY OTHER DATA REQUIRED FOR DESIGNING THE LINE & SUBSTATION.**
- 9. ANY VARIATION IN QUANTITY WITH RESPECT TO THE BPS/BOQ SHALL BE DEALT WITH AS PER CLAUSE 21.0 “DEVIATION TO THE SCOPE OF WORKS” IN SBD OF VOL-1 OF THE BID DOCUMENT (GENERAL CONDITIONS OF CONTRACT (GCC)).**

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 55/2022-23:

2X20 MVA, 132/33 KV Grid Sub-station with SAS, Jharbandh at Sankri with associated 132 KV LILO Transmission line (Line Length- 8.705 Km) on 132 KV Padampur-Nuapada DC line, at an Estimated Cost of the Package for Rs. 36.47 Crore in Bargarh district of Odisha on “Turnkey CONTRACT BASIS”.

The indicative layout diagram & SLD of the proposed sub-station ~~& associated transmission line~~ are enclosed *in the drawing folder in Vol-II*. The works are to be carried out on **EPC/Turnkey CONTRACT BASIS** till final commissioning of substation 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 as per the terms and conditions of the Standard Bid Document (SBD).
- (iii) Design, engineering, manufacture, supply, erection, testing & commissioning of all equipment for substation, construction of Transmission line & associated system, as detailed in the specifications and schedule of quantities and in subsequent. An indicative SLD of the substation has been provided in the technical specification which may be followed as a basis for finalization of the substation structural layout in consultation with OPTCL.
- (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 and transmission line 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 valid OPTCL approve vendor list and to be approved by the employer before placement of the order on the vendor/manufacturere.**
- (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. The Contractor shall also refer to the Technical Specification (Vol.-II), for proper understanding of the works involved in respect of each substation.

2.0 BRIEF SCOPE OF WORK:-

The scope of work on EPC/Turnkey CONTRACT 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.

PACKAGE 55/2022-23:

Engineering, Supply, Erection, Testing and Commissioning of 2X20 MVA, 132/33 KV Grid Sub-station with SAS, Jharbandh at Sankri with associated 132 KV LILO Transmission line (Line Length- 8.705 Km) on 132 KV Padampur-Nuapada DC line, at an Estimated Cost of the Package for Rs. 36.47 Crore in Bargarh district of Odisha on “Turnkey CONTRACT BASIS”.

i)	Supply of all equipment & materials for the sub-station and transmission line.
ii)	Detailed design of the sub-station & transmission 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 & as per IEC/IS standard.
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 etc at site.
vii)	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, control room building, boundary wall on the property line of sub-station, installation of switchyard kiosk, Firefighting system, Fencing etc
viii)	Erection, testing, commissioning of all equipment and handing over of the substation and transmission line complete in all respect as per approved scheme and to the satisfaction of the Employer including statutory inspection.
ix)	<p>Name of the work: Engineering, Supply, Erection, Testing and Commissioning of 2X20 MVA, 132/33 KV Grid Sub-station with SAS, Jharbandh at Sankri with associated 132 KV LILO Transmission line (Line Length- 8.705 Km) on 132 KV Padampur-Nuapada DC line, at an Estimated Cost of the Package for Rs. 36.47 Crore in Bargarh district of Odisha on Turnkey CONTRACT BASIS.</p> <p>A) Details of Provisions to be kept in the Sub-station are as follows: (1) 2X20 MVA, 132/33 KV AIS Sub-Station with SAS: 1 No. Scope:</p>

	<ul style="list-style-type: none"> ➤ 132 KV Feeder Bay: 02 Nos. ➤ 132 KV Transformer Bay: 02 Nos. ➤ 132 KV B/C Bay: 01 No. ➤ 132 KV Spare (unequipped) Bay: 02 nos. ➤ 20 MVA, 132/33 KV Transformer: 02 Nos. ➤ 33 KV Feeder Bay: 05 Nos. ➤ 33 KV Transformer Bay: 02 Nos. ➤ 33 KV B/C Bay: 01 No. ➤ 33 KV Spare (unequipped) Bay: 02 nos. <p>(2) Sub-Station Automation system.</p> <p>(3) Supply and installation of equipment & materials as per BPS (including all civil works).</p> <p>(4) Construction of Control Room building & other system like illumination of building, ventilation, firefighting & smoke detection facility etc as per BPS & specification.</p> <p>(5) Installation of Switchyard Kiosk (one no. in 132 KV side & one no. in 33 KV side).</p> <p>(6) Firefighting system for Transformers (Nitrogen Injection Type Fire Prevention & Extinguishing System)</p> <p>(7) Supply, erection, testing & commissioning of 20 MVA, 132/33 KV Transformer.</p> <p>(8) Construction of Transit house & other system as per specification.</p> <p>(9) Provision of Boundary wall, store shed, earthing system, fencing, roads, drains, gates, security shed, drinking water arrangement, Switchyard illumination and all other civil works etc as per specification.</p> <p>(10) Supply of Testing Equipment & its commissioning.</p> <p>(11) Testing and commissioning of Substation equipment & accessories.</p> <p>(11) Supply of mandatory spares.</p> <p>(12) Handing over of the completed system to the Owner including materials reconciliation with closure proposal.</p>
x)	<p>Name of the work: Engineering, Supply, Erection and Commissioning of 132 KV LILO Transmission line (Approx. Line Length- 8.705 Km) on 132 KV Padampur-Nuapada DC line, in Bargarh district of Odisha.</p> <p>B) Details of Provisions to be kept are as follows:</p> <p>(1) 132 KV D/C Transmission Line: Line Length: 8.705 Kms Approx...</p> <p>Scope:</p> <p>(2) Transmission Line route survey of entire stretch, Preparation of Tower profile & Tower Schedule, tower type selection, soil investigation for design of foundation.</p> <p><u>Additional Information:</u></p> <p>(a) Preliminary survey, Detail survey and resurvey (required for avoiding ROW problem) including but not limited to taking of levels, profile plotting, tower spotting, marking of towers locations at site including showing P&T line, power line, Railway line, river crossing, roads and submission of route map and survey report etc. The P&T lines and railway lines for a minimum distance of 8 kms on either side of alignment shall be clearly indicated.</p> <p>(b) Check survey including supply of all labour, T&P as per instruction of Engineer in Charge and as per the approved profile.</p> <p>(c) Preparation of land schedule with HAL & SAVIK classification on revenue maps indicating alignment therein duly authenticated by Revenue Inspector & Tahasildar, enumeration of trees with the help of Forest officer and other prominent features required for alignment of the proposed 132 KV line. Final</p>

	<p>route to be plotted on 1:50000 topo sheet for approval.</p> <p>(d) Soil Testing in complete shape along with submission of report etc. up to the depth of 7.0 Mtrs, Soil Testing in complete shape along with submission of report etc. up to the depth of 15 Mtrs, Soil Testing in complete shape along with submission of report etc. up to the depth of 45 mtrs for River bed pile</p> <p>(3) Supply of Tower Materials, OPGW system, Insulators, Hard ware & other clamps and connectors, Tower accessories, Earthing devices etc as per the BoQ.</p> <p>(4) Tower foundation, Erection of towers, Stringing of conductor, Stringing of OPGW system for the proposed transmission line, welding of tower bolts & nuts, fixing of tower accessories, earthing of towers as applicable as per spec.</p> <p>(5) Settlement of all issues related to right of Way & responsibilities of acquiring Right of Way (ROW) lies with contractor at his risk and cost.</p> <p>(6) Responsibilities of getting clearance from PTCC, Railway (if applicable), NHAI (if applicable), Forest (if applicable), Oil & Gas pipe line, Water and other Statutory/Govt. bodies lie with the contractor at his risk and cost (except payment of statutory fees).</p> <p>(7) Testing and commissioning of Transmission Line & accessories.</p> <p>(8) Handing over of the completed system to the Owner including materials reconciliation with closure proposal.</p>
xii)	<p>OPGW SYSTEM:</p> <p>(1) Supply, Installation, testing & commissioning of OPGW related equipment and materials as per specification & price schedule. The link shall be as per the SLD enclosed.</p> <p>(2) Testing and commissioning of OPGW system.</p>
xiii)	<p>Following scope of activities against obtaining Forest Clearances are highlighted:</p> <p>(a) Getting Permission for Survey from Forest Authorities and Collection of Coordinates from ORSAC and submission of both soft copy & hard copy of Forest Diversion Proposal Map to concerned DFO and DFO office will forward the same to ORSAC for verification and validation. Certification of Map of forest land by representative of different departments as per statutory requirements of Odisha Government is to be submitted in 06sets of hard copy and one soft copy and a separate map to this effect duly certified by representatives of different departments as per statutory requirements of Odisha Government is to be submitted in 6sets of hard copy & one soft copy.</p> <p>(b) Documentation and E-filing of FC application (Form-A, Part-I).</p> <p>(c) Field Verification report of DFOs (Form A, Part-II).</p> <p>(d) Inspection report by RCCF (Form-A, Part-III).</p> <p>(e) Recommendation by Nodal officer (FC Act, O/o PCCF (Form-A, Part-IV).</p> <p>(f) Recommendations and submission for forest Clearance by State Forest and Environment Dept. to MoEF, Govt. of Odisha (Form-A, Part-V).</p> <p>(g) Stage-I Clearance (With conditions) by MoEF, GOI (Form-A, Part-VI).</p> <p>(h) Complying the stipulations of stage-I clearance).</p> <p>(i) Stage-II clearance by MoEF, GOI.</p> <p>However any other activities other than above required for obtaining Forest clearance are also to be considered.</p>
xiv)	<p>Time is the essence of the contract. All the work as indicated in the Price Schedule shall be in the PERT Chart for approval by the authority at the beginning of contract.</p> <p>Satisfactory conclusion of the Contract.</p>

Note:

- i. The aforesaid scope of work is only indicative.
- ii. The detailed scope of package(s) / works is given in Volume-II
- iii. The detailed BOQ (Bill of Quantity) is given in the Price schedule.

*** MAIN BUSES SHALL BE WITH TWIN ACSR MOOSE CONDUCTOR. (220KV, 132 KV & 33 KV MAIN BUS)**

****RESERVE/TRANSFER BUS SHALL BE WITH SINGLE ACSR MOOSE CONDUCTOR.**

***** 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) SAS system .
- 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 overhead 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) Supply, Erection, testing & commissioning of the following 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-VIIA.**
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 100mm 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 lightning 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 Clause No. **48.0 & Clause No. 67 of GCC.**

(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)Bus1425/1050/650/170
 - ii)Equipment other than Transformer1425/1050/650/170
 - 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-phase3900/2160/1300/320
 - ii) Phase-to-earth3400/2160/1300/320
 - iii)Sectional clearance6500/5000/4000/3000
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/Cartrons, 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	Lost Order		Final Document		
			For Review	For Records	Transparency	Prints (Photostat)	Electronic
FOR SUB-STATION							
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.						
23.	Filled in equipment data sheets as per enclosed format.						

SL No.	Description	With Bids	Post Order		Final Document		
			For Review	For Records	Transparency	Prints (Photostat)	Electronic
24.	Complete literature, leaflets for all equipments.						
25.	Operational/maintenance manual.						
26.	Deviation schedule w.r.t. a) Specification 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 a)Installation Manual b) Operating/Maintenance. c)Catalogues/ Brochures.						
FOR TRANSMISSION LINE							
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. a) Specification 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.						
49	List of commissioning/maintenance spares.						

SL No.	Description	With Bids	Post Order		Final Document		
			For Review	For Records	Transparency	Prints (Photostat)	Electronic
50	Data Book/Manual a) Installation Manual b) Operating/Maintenance. 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 RATING (HIGHEST SYSTEM VOLTAGE)	IMPULSE WITHSTAND LEVEL*	MINIMUM CLEARANCE TO EARTH†	MINIMUM CLEARANCE BETWEEN PHASES	MINIMUM CLEARANCE FROM ANY POINT WHERE THE MAN MAY BE REQUIRED TO STAND TO THE NEAREST UNSCREENED CONDUCTOR IN AIR (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.

A	400 KV SIDE:
1	COLUMN: 4TA,4TB,4TC,4TD TYPE,- HEIGHT-29 (Additional Peak 5 Mtrs) MTRS, WEIGHT-10 MT
2	BEAM:4GA,4GB TYPE,-LENGTH- 27 MTRS, WEIGHT-4 MT
B	220 KV SIDE:
1.	COLUMN: P1S TYPE,- HEIGHT-21.5 MTRS,WEIGHT-4.464MT
2.	BEAM:Q1 TYPE,-LENGTH-18 MTRS, WEIGHT-1.473MT
C	132 KV SIDE:
1.	COLUMN: T1S TYPE,- HEIGHT-15 MTRS,-WEIGHT-1.193 MT
2.	COLUMN: T4S TYPE,-HEIGHT-11 MTRS,-WEIGHT-0.924 MT
3.	BEAM:G1 TYPE,-LENGTH-10.4 MTRS,-WEIGHT-0.613 MT
4.	BEAM:G2 TYPE,-LENGTH-14.9875 MTRS,-WEIGHT-0.906 MT
5.	BEAM:G1X TYPE,-LENGTH-10.4 MTRS,-WEIGHT-1.370 MT
6.	BEAM:G1,2 TYPE,-LENGTH-10.4 MTRS,-WEIGHT-1.25 MT
D	33 KV SIDE:
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
E	THE BAY WIDTH OF DIFFERENT VOLTAGE LEVEL ARE AS BELOW
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) + 3 mtrs type: Unit weight: 2.598 MT.
- (xiii) + 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. Make of Equipment & Materials to be used in the Sub-station and Transmission lines, shall be from valid OPTCL approve vendor list and to be approved by the employer before placement of the order on the vendor/manufacturer.

END OF VOLUME-II –SECTION-I (SCOPE OF WORK)