ORISSA POWER TRANSMISSION CORPORATION LIMITED

CONSTRUCTION OF 2X40 MVA (220/33 KV) 220/33 KV GAS INSULATED (SF6) SUB-STATION AT INFOCITY-II ,BHUBANESWAR & ASSOCIATED 220 KV DC LILO LINE ARRANGEMENT ON ONE CIRCUIT OF THE EXISTING NARENDRAPUR-MENDHASAL DC LINE ON TURNKEY BASIS.

VOL-IIA

SCOPE OF WORKS

NOTICE INVITING TENDER-NIT NO. 22/ 2012-13

TENDER SPECIFICATION NO Sr. G.M- CPC- TENDER- GIS INFOCITY-II- PACKAGE- 23/ 2012-13.

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 **(** M/S ORISSA POWER TRANSMISSION CORPOTATION LIMITED.) is strengthening their Transmission and Distribution systems by way of constructing the following sub-station and transmission line package. A SF6 Gas Insulated substation is proposed to be established at INFOCITY-II,Bhubaneswar.

PACKAGE- 23 / 2012-13: **CONSTRUCTION OF 2X40 MVA (220/33 KV) 220/33 KV GAS INSULATED (SF6) SUB-STATION AT INFOCITY-II ,BHUBANESWAR & ASSOCIATED 220 KV DC LILO LINE ARRANGEMENT ON ONE CIRCUIT OF THE EXISTING NARENDRAPUR-MENDHASAL DC LINE *ON TURNKEY BASIS,*** in the state of Odisha as outlined in the detailed scope of work. The indicative layout diagram of the scheme is enclosed ***in the drawing folder in Vol-II***.

Design, manufacture, assembly ,erection , testing and commissioning at works, inspection, packing, transport, unloading and delivery at site,storage of 230 KV gas insulated switchgears (GIS),and accessories, start up, essential spares, tools, tackles and testing equipments for the proposed 230/33KV Sub-station Indoor type GIS situated at INFOCITY-II,BHUBANESWAR,ODISHA, INDIA.

The provisions indicated below shall also be included in the scope of main equipment supply as per general arrangement for main equipment to be supplied.

1. First filling of SF6 gas.
2. Control cabling between GIS and local control cubicle.
3. Earthing circuits to the earth mat risers.
4. Equipotential earth mat.
5. Tools, accessories and testing instruments required for erection, tests and commissioning.
6. Spares required to meet out any emergency situation during erection at site.
7. All supports of GIS.
8. All accessories and testing instrument for site testing of the GIS.
9. All special tools required for operation and maintenance of GIS.
10. Sf6 gas handling plant 'Sf6 gas service cart'Sf6 gas leak detector.
11. Spares for auxiliary system and
12. Testing equipment to carryout on site testing of power frequency test.

TRAINING

Training in maintenance for the Engineers from OPTCL for 4 weeks at manufacture's site. Training in operation for the Engineers from OPTCL for 4 weeks at site. Factory inspection/acceptance test at the factory.

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

The scope of the work includes:-

i) Design, manufacture, testing, supply & commissioning of all equipment for substation and transmission lines, as detailed in the specifications and schedule of quantities and in subsequent clauses except supply of Auto and Power Transformer and PLCC indoor equipment which shall be supplied by the Employer. The contractor shall load, unload, transport, erect, connect to the system, test and commission the power transformer & the PLCC equipment. Installation of PLCC equipment at remote (existing) end and proposed end of the sub-station or any modification shall be under the scope of the contractor. A general single line diagram showing installations, removing and erection of PLCC equipment has been provided in the technical specification. An indicative SLD & structural layout 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.

ii) Execution of all civil works as per schedule for erection of all substation equipment, structures and foundation of transformers, roads, culverts, rain water harvesting arrangements, construction of earth mat, cable trench, drainage system, Fencing etc.

iii) 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.

iv) 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.

v) 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.

vi) The contractor(s) shall arrange clean water for construction and curing to the civil works.

vii) The work as mentioned in the price schedule shall be considered for the evaluation of the bid.

viii) 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.

ix) 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.

x) The contractor shall supply one official copy of each Standard listed in the appropriate schedule.

xi) The assembled equipment for GIS shall be capable of withstanding electrical, mechanical and thermal ratings of the specified system. All joints and connections shall be able to withstand the forces of expansions, vibrations, contraction and specified seismic requirements without deformation, malfunction and leakage. Optimized arrangements are required to reduce installation time, provide ease of operations, minimize maintenance, repair and facilitate future additions.

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:PACKAGE- 23 /2012-13*. (GIS INFOCITY).*

i)	Supply excluding power transformers and PLCC (indoor) Equipment (PLCC Panel & RTU)
ii)	Detailed design
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 material & accessories at site.*
vii)	*(a) "***CONSTRUCTION OF 2X40 MVA (220/33 KV) 220/33 KV GAS INSULATED (SF6) SUB-STATION AT INFOCITY-II ,BHUBANESWAR***ON TURNKEY BASIS"*** **GAS INSULATED (SF6) SUB-STATION AT INFOCITY-II ,BHUBANESWAR *has :*** ***(1) 05*** *nos. 220 KV SF6 gas insulated bays (Feeder-2,Transformer-02, Bus-coupler-1 & provision of 02 Nos. spare bay extendable at both side of the gas insulated 220 KV arrangement in t****wo Main*** *Bus arrangement .* ***&*** ***(2) 10*** *Nos 33 KV SF6 gas insulated bays Bays (2 Transformer bay,1 B/C Bay, 7 Nos Feeder bay & provision of 02 Nos. spare bay extendable at both side of the gas insulated 33 KV arrangement in Main & Transfer Bus Arrangement.* ***&*** ***(3)****(a)Supply and installation of SF6 gas insulated equipment as per BPS (including all civil works). Provision of extendable (at both side) spare bays as suggested besides the present scope of work. (b) with required column foundations, supply & erection of structures with beam,site surfacing (metal spreading),earth mat laying etc as required are to be considered. (c) Receiving the 02 Nos power transformers (****220/33 KV, 40 MVA****) from the store of OPTCL & construction of transformer foundation,its installations,its testing and commissioning,*(d) Testing and commissioning of gas insulated Sub station & accessories as per the standard practice (e) Construction of Sub-station building for 220 KV side and 33 KV side of SF6 gas insulated system (f) Construction of Control room building (g) Supply and arrangement of complete sub-station automation & control protection system including testing and commissioning (h) Construction of roads,culverts,drainage,colony quarters,security cum visitors room, store shed, lighting & illumination arrangement (for the sub-station, control room building, colony quarters,street light,security room etc) (i) Provision of fire fighting system *(j) Handing over of the completed system along with the mandatory spares & T&P,s to the Owner.* ** Approximate Sub-station area(Land):* ***7*** *Acres.*

viii)	**Construction of 220 KV Double circuit Transmission line on 220 KV DC Tower to the proposed Gas Insulated sub-station at Infocity-II, Bhubaneswar by making LILO on one circuit of existing Line of 220 KV MENDHASAL-NARENDRAPUR (NEAR Mendhasal) (Line Length of both the circuit approximately 02 Kms.)** (1) Transmission Line route survey of entire stretch, Settlement of all issues related to right of Way and laying of line (including all civil works). (2) Testing and commissioning of Transmission Line & accessories. (3) Handing over of the completed system to the Owner (4) Satisfactory conclusion of the Contract. *(5) Installation of PLCC indoor equipment (owner supply item) at both the end of the sub-station.*
ix)	*(a) Supply & Installation of PLCC related equipment. The link shall be as per the SLD enclosed.* *(b) Testing and commissioning of Sub station.* *(c) Handing over of the completed system to the Owner* *(d) Satisfactory conclusion of the Contract.*
x)	*Construction of two nos GIS building as per the latest standard practice adopted by PGCIL. All care should be taken to accommodate the bays as proposed and also to accommodate the future scope. The details of the GIS building are as below.* *(a) 220 KV Side GIS Building (Approximate :Plinth Area 33X12 Sq Mtrs)with provision of a 5Ton EOT Crane in the said building. The LCC for the 220 KV side shall be installed in the same building in a dust free cabin. Fire fighting system,illumination ,ventilation etc as per standard practice for GIS building should be provided. In case the Technical specification is not adequate GIS building specification (latest) of PGCIL may be strictly followed.* *(b) 33 KV Side GIS Building(Approximate:Plinth Area 15X8 Sq Mtrs). The LCC for the 33 KV side shall be installed in the same building in a dust free cabin. Fire fighting system,illumination ,ventilation etc as per standard practice for GIS building should be provided. In case the Technical specification is not adequate GIS building specification (latest) of PGCIL may be strictly followed.*
xi)	*Relay panels & BCU's for sub-station automation are to be accommodated in Control room building.*
xii)	*220 KV & 33 KV Surge Arresters are to be installed as per AIS. The same should not be considered in GIS system.*
xiii)	*220 KV Line CVT's are to be installed as per AIS. The same should not be considered in GIS system.*
xiv)	*The size of the XLPE cables to be used in 220 & 33 KV side to be decided during detail Engg. However the current rating and size of the cables are indicated in the BPS.*

(C) The aforesaid scope of work is only indicative. The detailed scope is described in the Bidding Documents, which are available for inspection & sale, at the address mentioned at para 18.0, as per details schedule given below:

(D): SALIENT TECHNICAL FEATURES OF PACKAGES:

PACKAGE NO.	NAME OF THE SUB-STATION (S) & ASSOCIATED TRANSMISSION LINE	TRANSFORMER CAPACITY (OPTCL'S SCOPE)	NO OF BAYS IN INFOCITY-II ,BHUBANESWAR SF6 GAS INSULATED SUB-STATION				TYPE OF LINE & LINE LENGTH (IN KMs)	NATURE OF FOUNDATION
			220 KV	PROVISION OF 220 KV EXTENDABLE BAY EXTN.	33 KV	*PROVISION OF 33 KV EXTENDABLE BAY EXTN.*	220 KV LINE	
23/2012-13	*"*CONSTRUCTION OF 2X40 MVA (220/33 KV) 220/33 KV GAS INSULATED (SF6) SUB-STATION AT INFOCITY-II ,BHUBANESWAR & ASSOCIATED 220 KV DC LILO LINE ARRANGEMENT ON ONE CIRCUIT OF THE EXISTING NARENDRAPUR -MENDHASAL DC LINE *ON TURNKEY*	220/33 KV, 40 MVA POWER TRANSFORMER: QTY: 02 Nos.	**5**	**2**	**10**	**2**	220 KV DC Transmission line on 220 KV DC Tower LILO on the existing MENDHASAL - NARENDRAPUR 220 KV DC TR LINE (Approximate Line length is **2 Kms.)**	Bidder are requested to visit site and asses.

	BASIS"							

2.1. Substation

2.1.1. Electrical

The scope includes but is not limited to

i) Supply erection, testing & commissioning of the following SF6 GAS insulated sub-station equipment for 220 KV and 33 KV:

I. Circuit breakers

II. Isolators

III. Current transformers.

IV. Voltage transformers (capacitive and inductive)

V. CT, CVT, IVT console boxes with aluminium alloy having minimum three mm thickness.

VI. All out door kiosks/boxes, shall be GI sheet of minimum 2mm thickness with aluminium alloy ***canopy*** (rain hood) of 3mm thickness.

VII. Surge arresters

VIII. Post insulators

IX. Protection, control, metering and sub-station automation system.

X. PLCC systems : ***Wave Trap,LMU & LMDU,Coaxial Cable,EPAX,Telephone sets,Fax m/c etc (but Except indoor PLCC Panel)***

XI. Insulator strings with hardware

XII. Busbar, circuit conductor and all conductor accessories. Other interconnection shall be through Moose ACSR .

XIII. Power and control cables**, fiber optical 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.

XIV. AC/DC systems including all distribution boards, battery and charger systems, auxiliary transformers.

XV. Air conditioning plant and systems for control room

XVI. Fire fighting systems and equipment

XVII. Steel structures for switchyard gantries and portals (lattice type); and equipment (pipe type) including those for lightning protection.

XVIII. Earthing system and earthing conductors.

XIX. Testing and maintenance equipment.

XX. Lighting of substation area and substation buildings. Illumination and emergency lighting system at different locations.

XXI. Event logger panel.(for 220/132/33 KV Sub-station)

XXII. AC and DC distribution boards as per requirement and as proposed.

XXIII. Bus bar protection scheme (for 220kV bus only).

XXIV. Disturbance recorder with Time synchronization. (GPS)

XXV. Sub station level PC/Lap top provision for Relay configuration with their software.

XXVI. 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.

XXVII. 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.

XXVIII. 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 de signed using under ground cables only. No over head conductors are per mitted 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 out door 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
2. Indoor PLCC/RTU equipment (PLCC Panels) at both the ends.

iii) Supply Only of the following equipments:

1. Mandatory spares for substation equipment being supplied under this contract as per Bid proposal Sheet(BPS) **schedule-3**.
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 switch yard 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 rain water 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 mtr. wide & the road inside switch yard shall be of concrete road as per technical specification. The other roads main and approach road shall be 7 mtrs wide and shall be bitumen grading. 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 spike not less than 2.5mtrs 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 switchyard. The earthing shall be extended beyond 2 mtrs from the fencing and the fencing earthing are also to be taken care.

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

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

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

23. 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. Supply of all tower structural materials as per requirement. The contractor shall preferably adopt OPTCL designed standard tower structures for use in various transmission lines, the details of which are given else where in this chapter.

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

3. Electrical System Data of 220/132/33

1.	Nominal System Voltage (KV)	220/132/33
2.	Highest System Voltage (kV)	245/145/36
3.	System Neutral Earthing.	Effectively earthed
4.	Basic Insulation Level (kVP)	
i)	Bus	1050/650/170
ii)	Equipment other than Transformer	1050/650/170
iii)	Transformer	1050/650/170
5.	Power Frequency withstand voltage (KV rms)	460/275/80
6.	System fault level KA	40/40/~~25~~
7.	Creepage distance for insulators (mm)	6125/3625/900
8.	Min. recommended clearance in air (mm) as per CBIP	
i)	Phase-to-phase	2160/1300/320
ii)	Phase-to-earth	2160/1300/320
iii)	Sectional clearance	5000/4000/3000
9.	Min. ground clearance (as per IE Rules)	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)	4500//3000/1500
ii)	Strung bus (mm)	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 220 kV, 132 kV and 33 KV equipment and structural steel shall be packed and shipped as per standard international practice.
Container/Cartoons, 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 posses 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 posses appropriate valid supervisory certificate of competency issued ELBO, Odisha.

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

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

SL No.	Description	With Bids	ost Order		Final Document		
			For Review	For Records	Transparency	Prints (Photostat)	Electronic
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.						

SL No.	Description	With Bids	ost Order		Final Document		
			For Review	For Records	Transparency	Prints (Photostat)	Electronic
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.						
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 toolsand 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.						

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

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.

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:**
3.	COLUMN: P1S TYPE,- HEIGHT-21.5 MTRS,WEIGHT-4.464MT
4.	BEAM:Q1 TYPE,-LENGTH-18 MTRS, WEIGHT-1.473MT
C	132 KV SIDE:
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
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.

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 E*quipment & Materials to be used in the Sub-station and Transmission lines.*

The following make of the equipments ***&*** 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, 50KA	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 & 220 KV(Dead / Live Tank)	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/SWITHGEAR&STRUCTURALS/GR POWER/AREVA/CGL
	(II) 220KV, 132KV & 33KV	ABB/SIEMENS/SWITHGEAR&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	RASTRIYAUDHYOG/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)/ TECHNOCRAT (CUTTACK)/UNITED ENGINEERS /BOSE ENGINEERING (INDIA) / ALFA AUTOMATION/ AMARA RAJA/ CHHABI ELECTRICAL
30	CLAMPS AND CONNECTORS	ELECTROMECH TRANSTECH/ RASTRA UDYOG /TYCO/IAC /ASWINI KUMAR & CO.

31	GI BOLTS & NUTS	NEXO/ GKW/ ASP/ MAHESWARI (P) FASTENERS & BRIGHT PVT. LTD
32	220V PLANATE BATTERY	EXIDE
33	48V VRLA BATTERY	EXIDE /AMARRAJA
34	220V DC BATTERY CHARGER	STATCON POWER CONTROLS/ AMARRAJA/ CHLORIDE INDIA (FORMERLY CALDYNE)
35	48V DC BATTERY CHARGER	SIGNOTON(INDIA)/ CHLORIDE INDIA (FORMERLY CALDYNE)/ STATCON POWER CONTROLS./ AUTOMATIC ELECTRIC/ AMARRAJA
36	WAVE TRAP	AREVA/ ABB/ BPL
37	DIGITAL PLCC WITH PROTECTION COUPLER, FSK MODEM FOR VFT	AREVA/ ABB/ SIEMENS/ MAKE CONFIRMING TO IEC STANDARD & COMPATIBLE WITH OPTCL SYSTEM
38	EPBX	BPL/SIEMENS/PUNCOM
39	RTU	ABB/ SIEMENS/ AREVA/ CHEMTROL MAKE CONFIRMING TO IEC 870-5-101 PROTOCOL & COMPATIBLE WITH OPTCL SYSTEM
40	220/132KV LINE TRAP	AREVA/ABB/CGL/BPL/GYRO
41	MEASURING INSTRUMENTS FOR TELECOM	ELECTRONICA/FLUKE/PHILIPS
Sl No	Description of Equipment or material	Name of the Vendor
42	SPILTTER FOR CFE	ALSTOM/CEGELAC
43	STALLION MODULE FOR CFE (PROPRIETARY)	STALLION TECHNOLOGIES INC. / ANY OTHER REPUTED 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 ENGINEERS FOR TECHNICAL SOLUTIONS / ALPHA TESTING LABORATORY
47	CONCRETE TESTING, PILE INTEGRITY TESTING	IDAX TESTING LAB. PVT.LTD
48	MEGGER MAKE TESTING & MEASURING INSTRUMENTS	PCI 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 each 132/33 kV S/S	At each 220/132/33 kV S/S	At each 220/33 kV S/S
1	Foam Type	Nos	9 ltrs	2	4	4
2	Dry chemical PowderType(Trolley mounted)	Nos	22.5 Kgs	2	4	2
3	Dry Powder Type	Nos	5 Kgs	2	4	2
4	Carbondioxide (CO_2	Nos	9Kgs	5	10	5
5	CarbonDioxide (CO_2)	Nos	4.5Kgs	5	10	5
6	Carbon dioxide (CO_2)Trolley mounted	Nos	22.5 Kgs	2	4	2
7	Fire bucket with (a set comprises of six nos Bucket in each stand & one stand)	Set		3	5	3

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 132/33 KV S/S	At each 220/132/33 KV S/S	At each 220/33 KV S/S
1.	160 kv transformer oil breakdown voltage test set	Nos	1	1	1
2.	Insulation resistance tester (megger)	Nos	1	1	1
3.	Oil sampling bottle	Nos	4	4	4
4.	SF6 gas leak detector	Nos	1	1	1
5.	LCD, digital multimeter	Nos	2	2	2
6.	Analogue Multimeter(features same as digital multimeter)	Nos	1	2	1
7.	LCD, clamp on meter	Nos	2	2	2
8.	Digital earth tester	Nos	1	1	1
9.	Discharge rod as per standard for carrying out the switch yard maintenance work	Nos	6	6	6
10.	Rubber gloves of operation of isolators and earth switch	Pairs	2	2	2
11.	Relay tools kit	Sets	1	1	1
12.	Portable emergency light	Nos	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. Make of PC and printer: HP/DELL	Set	1	1	1

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

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.

Sl 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	Set of "D" spanner(6mm – 42mm)	Set	1	1	1
2	Set of "Ring" spanner(6mm – 42mm)	Set	1	1	1
3	Socket wrench with sockets, handles, and other attachment(6mm-42mm)	Set	1	1	1
4	Insulated cutting plier	Nos	2	2	2
5	Insulated nose plier	Nos	2	2	2
6	Monkey plier	Nos	1	1	1
7	Circlip plier	Nos	1	1	1
8	Pipe wrench a)12 inch – 1 no b)18 inch – 1 no	Set	1	1	1
9	Sly wrench a)12inch – 2 nos b)18inch – 1 no	Set	1	1	1
	Insulated handle screw drivers of different sizes as per required a)12inch plain head – 2 nos b)8inch plain head – 2 nos c) 12inch star head – 1 no d) small size6inch plain and star head – 2 each e)Complete set of different head in one box/set -1set	Set	1	1	1
11	"L"-N keys set of different sizes in one box/set	Set	1	1	1
12	M.S Files(12inch and 6inch sizes) Round files and flat files-one each of different sizes)	set	1	1	1
13	Hammar with handle a)1 lb – 2 nos b)1/2 lb-2 nos c)2 lb-1 no	Set	1	1	1
14	Crow bar a)5 ft – 2nos b)3ft-2 nos	set	1	1	1

Sl 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
15	Steel scale(12inch)	Nos	2	2	2
16	Steel tape a)5 mtrs-2 nos b)30mtrs-1 no	Set	1	1	1
17	Oil cane	Nos	2	2	2
18	Spirit level (8inch)	No	2	2	2
19	Plumb head with string and attachment	No	1	1	1
20	Maintenance safety belt with all attachment and helmets(complete one set)	Set	3	4	3
21	Hand drill machine with different bits and key.(Wolf make)	No	1	1	1
22	Vacuum cleaner having hot blower provision with all attachments (Eureka Forbes make)	No	1	1	1
23	230-250VAC,80W,450mm sweep,1400 rpm stand(rugged) FAN Make: Almonard,CGL	No	2	4	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.

Sl 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+ 3mTO BE USED FOR MAINTENANCE OF EQUIPMENT INSIDE SWITCH YARD.

Heavy duty Two fold with sliding feature aluminium ladder to be used for the maintenance work equipment in the switch yard(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 (220 KV,132 KV & 33 KV: Breaker, CT, CVT, Isolators etc) & also other maintenance works. The height of the derrick will be suitable for lowering of the top pole of the circuit breaker up to 220 KV and other equipments upto 220 KV.

END OF VOLUME-IIA(SCOPE OF WORK)