PART 2

SECTION-6: EMPLOYER'S REQUIREMENTS

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A. **New 33 kV OH Lines**

1.00 GPS Survey

Mapping of route of proposed new 33 kV line GPS Survey in areas be performed mentioning various milestones. While GPS Surveying, existing electrical infrastructure in the locality should also be mapped. Line alignment (single line diagram) on political map with fair correctness, be prepared. SLD and GPS Survey report shall be approved by Project Manager and shall be used as basic document for assessment of works under the contract. On completion of line work, as built Single Line Diagram and pole wise line diagram showing pole wise materials used and pole-to-pole span should be submitted to Project Manager. This details shall be used as reference documents by Quality and Quantity Inspecting officials to execute inspection works.

2.00 Support (pole):

Following type of supports are envisaged for new 33 kV overhead lines-

a. 9 mtr long /400 kg PCC Poles
b. 13 m long WPB poles160 mm x160 mm 30.44 kg/m.
c. 12.8 m long Rail Pole (52 kg/m)-for river crossing

Steel bottom plate shall be used in WPB poles and cement concrete reinforced plate shall be used as base plate for PCC poles. WPB poles shall be cleaned till good surface finish and painted with 2 or more coats of red oxide paint and 2 or more coats of aluminium paint till good finish. WPB poles shall also be painted with 2 or more coats till good surface finish with anti-corrosive paint.

Painting of WPB Poles shall be performed at stores. Before shifting to site for erection, poles shall be offered for inspection and approval by WBSEDCL.

Before pickling, all welding, drilling, cutting and grinding shall be completed and all grease, paint, varnish, oil and welding slag shall be completely removed.

3.00 Fabricated steel items:

Fabricated steel items like top clamp, cross arm, bracket, clamps, cross bracings, bracings, strain plate, guarding channels, back clamp, etc shall be made of MS Channels, MS angle, MS flats as per approved drawings.

While fabricating, good quality electrical cutting tools and drill machine shall be used to ensure no sharp edges and perfect holes as per approved drawings. Gas cutting set should not be used for fabrication of MS steel items. Weld material shall be distributed equally between the two materials that were joined. The weld shall be free of waste materials such as slag. The weld surface should not have any irregularities or any porous holes (called porosity). The joint shall be tight. Most

welds need to demonstrate the required strength. One way to ensure proper strength is to start with a filler metal and electrode rating that is higher than your strength requirement.

The fabricated steel structures materials shall be hot-dip galvanized thoroughly internally and externally according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

4.00 Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of overhead structure items like cross arms, top clamps, brackets, clamps, bracing, strain plates etc.

While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633.

5.00 Stay Set:

Stay set shall be used at all turning locations, conductor dead end location, double pole structure, triple pole structure, four pole structure to nullify the tension of conductor. At dead end locations, stay sets shall be used in pairs in separate foundations. Erection of storm guys at suitable location in straight line may also be provided.

6.00 Earthing:

Following earthing arrangements are envisaged for new 33 kV lines:

a. GI Earthing spike made of 20mm solid rod
b. 6 SWG GI wire for earthing and guarding lacing.
c. ACSR 20 sqmm for Cradle guard lead wire.

Each 33 kV line support shall be provided with one GI earthing spike made of 20 mm solid rod connected with 6 SWG GI wire. Overhead line structure shall be connected to GI earthing spike or GI Earthing Coil using 6 SWG GI wire. GI nuts, bolts & washers shall be used to join two GI wires and 20 mm solid spike rod.

7.00 Insulator and hardware –

33 kV polymer Pin insulator with suitable hardware fittings shall be used. Insulator should be tied properly using binding wire and tape/helical form fitting. In road crossing and line crossing locations bridling cross arms and pin insulator shall be used.

The individual insulator shall be checked for insulation resistance before overhead line installation. Insulator should properly be cleaned before installation. No damage/crack insulator should be used.

8.00 ACSR Conductors:

a) 6/4.72 mm + 7/1.57 mm (100 mm^2 Al. Area) – Dog
b) 30/2.59 mm + 7/2.59 mm (150 mm^2 Al. Area) – Wolf

Care should be taken while drawing conductor from the drum. Proper roller should be used while handling conductors during erection. Jointing sleeves, binding materials, PG clamps, bi-metallic conductor shall be used for conductor jointing, insulators fixing, jumpering and termination at equipment respectively.

Proper sag should be maintained using sag chart table. While tensioning, care should be taken to avoid tension on pin insulator. Therefore, proper alignment of line to be ensured. Conductor joint should not be in the middle span but may be planned nearer the support.

At terminal location, care should be taken while connecting two sections to avoid bird faults. Therefore, pin insulator is to be used to handle the conductor on cross arm.

9.00 Anti-climbing device:

3.0 kgs, 2.5mm dia (12 SWG) galvanized barbed wire shall be used on each 33 kV support. Galvanized barbed wire should be properly dressed and crimped at termination. While wrapping the wire on support, proper tension should be maintained.

10.00 Danger board:

Each support should be provided with a danger board as per IS . Danger board should be in bi-lingual languages (local language and English).

11.00 Support foundation:

Cement concrete in mixture 1 part cement, 3 part coarse sand, 6 part 40 mm size aggregate stone chips (1:3:6) shall be used in H-Beam 11 kV line supports.
PCC pole pit shall be refilled with 200 mm average size of boulder or/and bricks ballast mixed with excavated earth. Proper ramming shall be performed for better compaction.

Muffing shall be provided on WPB poles to prevent direct entry of rain water along the poles. Cement Concrete of 1:2:4 (1 part Cement, 2 parts coarse sand and 4 parts 20mm aggregate stones chips) shall be used for individual poles.

Steel plate shall be used in WPB supports and cement concrete reinforced plate shall be used as base plate for PCC poles.

12.00 Trimming of tree:

The Contractor shall arrange Tree trimming as required.

13.00 Statutory clearances:

During execution of 33 kV Line work, all statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance, horizontal and vertical clearances from buildings/objects etc. All road crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support.

B. **New 33/11 kV Substation**

1.00 Details of New 33/11 kV Substations –

Sl. No.	Name of the SubStation	District	Capacity	Package
1	Herobhanga	South 24 PGS	2X6.3 MVA	Package1
2	Jharkhali	South 24 PGS	2X6.3 MVA	
3	Moukhali	South 24 PGS	2X6.3 MVA	
4	Kumorhat	South 24 PGS	2X6.3 MVA	
5	Jhikuria	Paschim Midnapur	2X6.3 MVA	Package2
6	Kashmuli	Paschim Midnapur	2X6.3 MVA	Package3
7	Madan Mohan Chak	Paschim Midnapur	2X6.3 MVA	
8	Guiadaha	Paschim Midnapur	2X6.3 MVA	
9	Gangabandh	Jhargram	2X6.3 MVA	Package4
10	Debibarpur (Narugram)	Purba Burdwan	3X6.3 MVA	Package5
11	Borai	Hooghly	2X6.3 MVA	Package6
12	Birchandrapur	Birbhum	2X10 MVA	Package7
13	Satpalsa	Birbhum	2X6.3 MVA	
14	Kaliganj	Nadia	2X6.3 MVA	Package8
15	Giria	Murshidabad	3X6.3 MVA	Package9
16	Baishnab Nagar (Per Deonapur)	Malda	2X6.3 MVA	Package10
17	Vikhahar	Dakshin Dinajpur	2X6.3 MVA	Package11
18	Gandharbapur	Dakshin Dinajpur	2X6.3 MVA	
19	Kunor	Uttar Dinajpur	3X6.3 MVA	Package12
20	Bogram	Uttar Dinajpur	2X6.3 MVA	
21	Sujali	Uttar Dinajpur	2X6.3 MVA	
22	Chaulhati	Jalpaiguri	2X6.3 MVA	Package13
23	Dinhata Sadar	Coochbehar	2X6.3MVA	
24	Dava	Purulia	2X6.3 MVA	Package14
25	Kalimati	Purulia	2X6.3 MVA	
26	Ratanpur	Bankura	2X6.3 MVA	
27	Deriapur	Bankura	2X10 MVA	Package15
28	Bishnupur	Bankura	2X10 MVA	

2.00 Following works are in the scope of Employer and shall be executed by Project Manager:

a) Acquisition of land for the substation and its possession to start constructional activities.

b) Confirm general layout of the substation

c) 6.3 MVA, 33/11 kV Power Transformer along with accessories will be supplied by WBSEDCL. Also installation of the PTR on plinth and its accessories at proposed 33/11 kV Sub-staion shall be done by WBSEDCL & are not under the scope of work. However, activity related to commissioning of PTR and related accessories shall be under the scope of Contract.

3.00 Types of substations are envisaged under this head is as per following:

Outdoor substation – in this type, 33kV section comprising breakers, isolators, 33/0.415 kV station transformer, CTs, PT, Lightening Arrester, Power Transformer, 33kV gantry shall be installed in out-door switch yard. Control panels of breakers shall be installed inside the control room. All 11kV equipment like CTs, Breakers and control panels shall be installed inside the control room. 11kV cables shall be used for connection of power transformer and breaker and Breaker to outgoing isolators. 11kV feeder isolators and 11kV Lightening Arresters shall be installed outdoor.

4.00 Power Transformers:

Power Transformers shall be 33/11 kV, 3 ph, 50 Hz, ONAN, Cu Wound, Outdoor Conventional type Power Transformer along with transformer oil, Buchholtz relay, breather, OTI & WTI, Marshalling Box, Conservator tank, oil level indicator, valves, Vent explosion plug, control wiring between sensing equipment and marshalling box, cable supporting tray on the body of transformer, transformer wheels, LV/HV bushing etc as required. Following type and capacity of power transformers are envisaged under the scheme:

i. 6.3 MVA (As per availability)
ii. 10.0 MVA with on load tap changer

Transformer foundations shall be constructed by turnkey Contractor considering manufacturer's recommendations/requirement of employer. Cement concrete including reinforcement steel shall be used for the foundation. WBSEDCL shall approve design and drawings of foundations. Proper shuttering, vibrator, curing shall be performed while constructing the foundations.

65 mm X 6 mm galvanized neutral earthing strips shall be supplied. Two distinct earth connection shall be provided for neutral earthing. The earthing strips shall be mounted on 11kV post insulators.

Transformer protective equipment like OTI, WTI shall be tested during pre-commissioning stage. Their electric connection upto marshalling box shall be performed as per Original Equipment Manufacturer recommendations/guidance of employer. Cable tray shall be installed for laying of control cable shall be laid on cable tray on transformer body so that cable shall not get heated by transformer

temperature. While commissioning the transformer tripping of breaker through all these equipment must be checked.

5.00 Breaker:

33 kV & 11 kV Vacuum Circuit Breakers shall be used for protection and control of power circuits. In outdoor substation, all 11 kV switchgears shall be indoor mounted type and 33 kV breakers shall be outdoor mounting type. The control panels shall be indoor type. The outdoor mounting type breakers shall be supplied with its mounting galvanized steel structures.

Detailed cable schedules, termination details and circuit diagrams of control panels, transformer marshalling box, breaker marshalling box, and capacitor banks equipment shall be prepared and submitted by turnkey Contractor for approval of WBSEDCL before commencing the work.

Cement concrete including reinforcement steel shall be used for the foundation. WBSEDCL shall approve design and drawings of foundations. Proper shuttering, vibrator, curing shall be performed while constructing the foundations for breaker.

Permanent maintenance platform shall be constructed for outdoor breakers and CT. WBSEDCL shall approve design of platform.

Control wiring between CT/breaker and control panel for outdoor mounting breakers/CT shall be routed through Junction box. Metallic Junction box shall be installed on support gantry structure of substation or on MS angle (50x50x6 mm) support. The boxes are to be erected, electrically connected with the existing system, properly earthed, and labeled. The test report of pre-commissioning checks shall be prepared and submitted. All CT terminals are to be ring type. 2.5 sqmm copper multi stands wiring 1.1 kV grade, ISI marked, IS 694 shall be used for control wiring.

6.00 Station Service Transformer:

100 kVA, copper wound, 33/0.415 kV Station Service Transformers shall be installed on Plinth.Cement concrete including reinforcement steel shall be used for the foundation. Design will be provided/ approved by WBSEDCL . Relevant Indian Standard Should be followed during the work.

7.00 Gantry structures:

Gantry structures made of PCC Pole 9 meter long (400 Kg). MS Channel for bus bar supports (Beam), angle for cross arms/supporting structures and clamps along with hardware items etc. fabricated steel structure items shall be hot dip galvanized and cleaned till good surface finish. The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633. Items shall be offered for inspection and approval by Project Manager.

8.00 AC Distribution board (ACDB)

415 Volts, ACDB shall be indoor floor mounted with mounting arrangements, three phase-neutral voltmeter, three phase ammeter and Selector switches, 63 Amps TPN switch fuse unit in incomer circuit, 32 Amps TPN switches in outgoing circuits equals the number of indoor breaker control panels plus number of outdoor VCB kiosk panel and having 20% spare outgoing circuits, etc. Alternatively, ACDB can also be erected on separate MS frame made of 50 mm x 50 mm x 6 mm angle.

Substation flooring shall be provided with suitable inserts to fix ICRCA 75 channel. This channel shall hold ACDB board. The board shall be installed on indoor trench. Cables shall have bottom entry. The board shall be grounded by 50 mm x 6 mm GI strip at two distinct connections.

9.00 DC Distribution board (DCDB)

DCDB would comprises of DC volt meter including mounting arrangements etc.as required as per technical specifications, approved drawings and scope of works. Alternatively, DCDB can also be erected on separate MS frame made of 50mm x 50mm x 6mm angle.

Substation flooring shall be provided with suitable inserts to fix ISMC 75 channel. This channel shall hold DCDB board. The board shall be installed on indoor trench. Cables shall have bottom entry. The board shall be grounded by 50 mm x 6 mm GI strip at two distinct connections.

10.00 Cables:

a. Control cables: 1.1 KV grade 2.5 mm^2 PVC insulated and PVC sheathed, armored, stranded, copper control cable with 4 core, 8 core and 12 core are envisaged in the substation.

b. HT Power Cables: In partly outdoor substation, 11KV XLPE Cables shall be used as per following requirements;
   - Between Power Transformer and Main Incomer Switchgear.
   - Between outgoing Switchgear and outdoor feeder DP structures

c. LT cable (FRLSH) for Internal Electrification works: following cables shall be used for internal electrification purpose:

   - 1.1 KV PVC insulated PVC sheathed ISI marked, IS 694, 10 mm^2, copper conductor, stranded, for internal electrification works between main DB and Sub DB or Su DB to switch board,
   - 1.1 KV PVC insulated PVC sheathed ISI marked, IS 694, 2.5mm^2 /4.00mm^2, copper conductor, stranded, for internal electrification works light & Fan and Power circuits respectively,
   - 1.1 KV PVC insulated PVC sheathed ISI marked, IS 694, 4.00mm^2, copper conductor, stranded weather proof cable for connection between outdoor area lighting luminary fixtures and its junction boxes,

Power Cables are to be laid as per best engineering practices. Power and control cables are to be laid in different alignments in cable trench. However, in case power/control cable is required to extend up to the equipment where cable trench is not constructed, they shall be laid in underground trench of width 300 – mm wide, provided with 2nd class brick protection (Approx. 10 bricks per meter length of laying) and sand protective covering (200 mm thick) and laid at the depth of 750mm minimum for LT cables and 1000mm for 11 kV cables. Laying specification of cable shall be as detailed in CPWD specification of laying power cables. Suitable loop length of 1.5 meter to be kept at the end points.

11.00 Junction Box and Control Cabling:

Junction box is to be installed on support structure of substation. The boxes are to be erected, electrically connected with the existing system, properly earthed and labeled.

All CT terminals are to be ring type. 2.5 sqmm copper multi stands wiring 1.1 kV grade, ISI marked, IS 694 shall be used for control wiring.

The junction box shall be earthed.

12.00 DC emergency lighting:

At-least four reputed make LED bulbs are to be provided of 7 watts {2 Nos in control room, 1 No in station battery room, 1 No in yard area). These bulbs shall be fed by DC station battery. The wiring of these bulbs shall be so designed that it will automatically turn ON in event of failure of normal power supply. Provision for putting these bulbs OFF by operator is also to be provided. Wiring is to be performed concealed using PVC insulated PVC sheathed 2.5 mm^2 stranded copper wire. An automatic change over switch is envisaged for this purpose. This may be installed at prominent location, generally easily approachable by operator in the substation control room.

13.00 Station Battery and battery Charger:

2 sets of Station Battery and Battery Charger shall be provided.

Station battery are to be supplied with steel racks made of Mild Steel finished with at least three Coats of anti-sulphuric paints of approved shade. The battery may be placed on two-tier formation of stand. The construction of battery rack shall suit site conditions of their placement. The rack shall be painted with three coat of acid proof paint of reputed make as approved by Project Manager. No metal fasteners / nails shall be used for construction of battery racks. The stand shall be supported on insulators to obtain necessary insulation from the earth and there shall be insulators between each cell and stand.

Initial charging of stationary battery shall strictly be done by Original Equipment Manufacturer (OEM). Detail charging and discharging cycle readings shall be recorded and submitted to Project Manager.

Battery room shall be provided with exhaust fan of air displacement capacity more than six times volume of battery room per hour.

The battery connections / terminals are to be cleaned and provided with petroleum jelly. Terminals hardware is to be provided with connecting cables. The inter-battery wiring cable shall be neatly dressed using cable ties, clamped and wired using ferrules, tag mark. New battery sets are to be provided with battery chargers as per detail specifications enclosed. Interconnecting cables and power supply cables originating / terminating at the battery charger, shall be neatly dressed using cable ties, clamped and wired using ferrules, tag marks, double compression glands etc. as applicable. Connecting cable and associated materials needed for commissioning of charger shall be treated as part of the battery charger. 1.1 kV multi-strands, copper conductors, PVC insulated and PVC sheathed cable for DC wiring between DCDB and Battery bank.

The agency shall provide following equipment at all the substations:

i. Two copies of battery instruction sheet duly laminated,
ii. Two sets of ISI marked electrical hand gloves,
iii. One cell testing voltmeter 3 – 0 – 3 volts,
iv. Two syringe hydrometers
v. One thermometer with specific gravity correction scale,
vi. One set of suitable spanners,
vii. Two acid resistant funnel,
viii. One acid resisting jar of 2 litters capacity,

14.00 Outdoor type Current Transformer and Potential Transformer:

Outdoor type Current and Potential Transformers are to be erected on supporting structure. In both the case, separate metallic Junction Box shall be installed on support structure of substation, The boxes are to be erected, electrically connected with the existing system, properly earthed, and labeled. The test report of pre-commissioning checks shall be prepared and submitted.

All CT terminals are to be ring type. 2.5 sqmm copper multi stands wiring 1.1 kV grade, ISI marked, IS 694 shall be used for control wiring..

The junction box shall be earthed.

15.00 Control Panels:

New panels as per the requirement of protection like feeder protection, transformer protection or incomer protection are to be supplied with each newly supplied breaker:

a. Breaker cum control panel shall be erected on ICRCA 100(75x50x6 mm) MS channel duly welded on MS angle inserted on indoor trench. Panels shall then be properly aligned, Cables shall enter with double compression glands, codified, lugged, and dressed.
b. Functional checks shall be performed on the control panel as per control wiring diagram.

c. All alarm, annunciation and trip circuits / indication & alarm circuits shall be tested and made operative,
d. The indication lamp shall be LED type lamp as per given specifications and shall be made operative,
e. Indicating instruments shall be calibrated,
f. Grounding of panel at two different locations by 50x6mm flat shall be provided. ,
g. Control relays shall be calibrated and checked for tripping and closing operations,
h. Pick up time / trip time and tripping at normal and reduced voltages shall be checked, properly adjusted and recorded,
i. Latching arrangement of relays shall be checked for operation,
j. Relay and instruments shall be tested from respective Zonal Testing unit of WBSEDCL.

16.00 Lightning Arrester:

Station Class LAs will be used in 33 kV and 11 kV with base steel structure, terminals bi – metallic connectors / PG clamps and earth connectors. LAs are to be separately earthed. All LA terminals / connections are to be tightened.

17.00 Internal Electrification:

Indoor Distribution Board having 63A TPN MCB, outgoing MCBs of suitable ratings for power and light & fan circuits are to be installed. Internal electrification of the control room includes following provision of fans, exhaust fans, LED illumination fixtures, Fluorescent Tube Light including switches, 3-pin sockets arrangements on each switch board.

a. Celling Fan, 1300mm with electronic type fan regulator: 8Nos.
b. Exhaust Fan, 650mm: 3 nos.
c. Fluorescent Tube Light (2X28 Watt, T5): 15 Set
d. Fluorescent Tube Light (1X28 Watt, T5): 5 Set
e. Fluorescent Tube Light, Corrosion free (1X28 Watt, T5): 2 Set
f. Bulk Head (23Watt, LED): 8 nos.

The above list of materials are not conclusive and may change/vary as per site requirements.

Two nos separate 3 m long 40 mm dia earthing shall be provided for internal electrification works.

a. Main Distribution Board and Sub-Distribution Boards,
b. ACDB, DCDB, Battery Chargers each at 2 distinct locations

Internal Electrification works' wiring shall be provided with single core PVC insulated & PVC sheathed 2.5 mm2 stranded ISI 694 marked copper flexible wire (for light and fan circuits) and 4.0 mm2 stranded ISI 694 marked copper flexible wire (for power points) in conceal arrangement in 25 mm dia 2 mm thick PVC ISI marked pipe and 2.5mm thick switch boards in flash arrangement. Neutral links are to be used in each switchboards. Jointing in neutral conductor other than at switching board shall not be permitted.

Iron junction box made of 18 gauges CRCA sheet shall be used for switchboard; 2 mm thick cotton impregnated hylum sheet is to be used for the purpose of switch board. ISI marked switched and sockets are to be used for Internal Electrification works. Earth wire must be made available duly connected with earth circuit for Earthing in each and every switchboard.

Reputed make indoor double door Miniature circuit breaker DB fitted with Miniature Circuit Breakers of MDS/ Havells/ Standard make or equivalent ISI marked shall be used for the protection. Reputed make LED illumination fixtures, Fluorescent Tube Light, Sodium Vapor Lamp, and fans are to be used for the substation. These materials are to be procured from authorized dealer of the materials manufacturers only. Documentary evidence may be submitted for source of supply of all electrical materials. Before procurement of materials Project Manager shall approve make, type and quality of materials.

Control Room lighting shall be designed to ensure minimum 300 lux illumination level through LED illumination fixtures, Fluorescent Tube Light, LED. The bidder shall submit calculation for achieving the above illumination before start of lighting work for approval of project manager.

18.00 Yard Lighting:

The substation area inside the fencing shall be illuminated provided with LED light fittings. Each fitting and its Junction box enclosures shall be IP 55 protection type. Water and vermin proof-ness is a must.

Area light supply from Substation DB to be extended through PVC insulated PVC Sheathed aluminium stranded armoured power cable sall be laid in underground trench .Laying specification of cable shall be as detailed in CPWD specification of laying power cables. Suitable loop length of 1.5 metre to be kept at the end points.

Pole mounted junction box (and not the Control Gear Box supplied with the fitting) shall be made of 2mm thick CR steel sheet of size 300X300X200mm fitted with SPN terminal block of 32A capacity, 10A SPN miniature circuit breaker of ISI mark and reputed manufacture. The JB shall be hot dip galvanized. The JB shall also conform to IP 55 protection for enclosure. Neoprene gasket shall be used in JB. 2 Nos. earthing terminals of 10 – mm dia shall be provided with 25X6mm size of mounting clamps. Bidders shall get JB drawing approved before start of manufacturing.

WPB poles shall be cleaned till good surface finish and painted with 2 or more coats of red oxide paint and 2 or more coats of aluminium paint till good finish. WPB Poles shall also be painted with 2 or more coats till good surface finish with anti-corrosive paint.

Painting of WPB Poles shall be performed at stores. Before shifting to site for erection, poles shall be offered for inspection.

19.00 ACSR Conductor and Aluminium Pipe:

i. 50 sq.mm. Rabbit- for shielding

ii. 100 sq.mm. Dog- for Jumpers & droppers
iii. 150 sq.mm. Wolf-for Bus Bars
iv. 200 sq.mm. Panther-for Bus Bars
v. 1.5 inch Aluminium Pipe-for Bus Bars

ACSR / Pipe shall be provided with hardware fittings, Connectors, T-clamps, bi-metallic clamps and PG clamps as per requirements. T – Clamps shall be provided on each jumper on bus bars. Line jumpers shall be provided with adequate size of PG Clamps (Two numbers PG Clamps at each end of jumper). Clamp shall be made of aluminium grade T-1F as per IS – 8309 having good electrical quality aluminium material and shall not be brittle in nature. Suitable Bi – metallic clamps shall be provided at bushings of transformers and circuit breakers. Also at all those points where joining of two different materials is found, bi –metallic clamps shall be provided.

Care shall be taken while drawing conductor from the drum. Proper roller shall be used while handling conductors during erection.

20.00 Insulator, hardware and connections to equipment:

33 kV and 11 kV polymer Disc/ Pin insulator with suitable hardware fittings shall be used. Insulator shall be tied properly using binding wire/helical form fitting. In road crossing and line crossing locations bridling cross arms and pin insulator shall be used.

The individual insulator shall be checked for insulation resistance before overhead line installation. Insulator shall properly be cleaned before installation. No damage/crack insulator shall be used.

21.00 Power receptacles:

Two power receptacles are envisages in switch yard area to provide power supply to Transformer Oil Filtration machine and other testing and commissioning related works. Each receptacles shall house 125A TPN MCCB as incomer, 32A 3 phase socket/switch and 1 No, 16A single phase Industrial type socket/switch of reputed brand and type.

22.00 Yard Earthing:

Earthing shall be provided with GI earth pipe and 75mmx8mm GI flat forming earth mat. 65mmx6mm GI flat shall be used for earth-riser. WBSEDCL shall approve arrangement of earthing network. Following arrangement envisaged for grid/ earth pipe.

Description of equipment	**Partly outdoor Substation**

Earth Pit made of 3 m long, 40 mm dia GI pipe /Chemical earthing	(a) 6.3/10 MVA PTR: 2 nos. Pipe earthing / PTR (b) Station Service Transformer: 3 nos. Pipe earthing (c) 33KV LA: 2 nos. Pipe earthing per set. (d) H-Beam earthing for shielding: 1 no. Pipe earthing /pole (e) Control Room: 5 nos. Pipe earthing (f) Battery & Charger: 2 nos. Pipe earthing (g) PTR LV Side: 2 nos. Pipe earthing
Earth mat	75mm X 8mm GI Flat
Earth riser	65mm X 6mm GI Flats

The above list are indicative. The earthing of Sub-Station/construction of Earth mat shall be done considering soil resistivity, dimension of the switchyard and other allied factors for which the employer shall provide approved design & drawing with details specifications.

23.00 Fabricated steel items:

Fabricated steel items like top clamp, cross arm, bracket, clamps, cross bracings, bracings, strain plate, guarding channels, back clamp, etc shall be made of MS Channels, MS angle, MS flats as per approved drawings.

While fabricating, good quality electrical cutting tools and drill machine shall be used to ensure no sharp edges and perfect holes as per approved drawings. Gas cutting set should not be used for fabrication of MS steel items. Weld material shall be distributed equally between the two materials that were joined. The weld shall be free of waste materials such as slag. The weld surface should not have any irregularities or any porous holes (called porosity). The joint shall be tight. Most welds need to demonstrate the required strength. One way to ensure proper strength is to start with a filler metal and electrode rating that is higher than your strength requirement.

The fabricated steel structures materials shall be hot-dip galvanized thoroughly internally and externally according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

24.00 Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of overhead structure items like cross arms, top clamps, brackets, clamps, bracing, strain plates etc.

While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633.

25.00 Fire Protection System:

Fire Buckets filled with sand: The fire buckets confirming to IS 2546/1974 filled with sand shall be installed at two places in new s/s – in control room and in switchyard near power transformer. There shall be 4 no. of buckets at each location in a s/s. The buckets shall be hanging on a steel stand. The buckets and the stand shall be as per relevant standards and will be filled with sand.

26.00 Portable Fire Extinguishers:

Carbon dioxide type and Dry chemical powder type fire extinguishers are also to be installed in newly constructed substation. All the portable extinguishers shall be of free standing type and shall be capable of discharging freely and completely in upright position. Each extinguisher shall have the instructions for operating the extinguishers on its body itself. All extinguishers shall be supplied with initial charge and accessories as required. Portable type extinguishers shall be provided with suitable clamps for mounting on walls or columns. All extinguishers shall be painted with durable enamel paint of fire red color conforming to relevant Indian Standards. Capacities of each type shall be as indicated in the schedule of quantities. Carbon dioxide (CO_2, type) extinguisher shall conform to IS:2878. Dry chemical powder type extinguisher shall conform to IS:2171.

27.00 Safety and operation equipment:

The substation shall be equipped with safety equipment for smooth operation and maintenance.

28.00 Following details shall be provided at each substations:

For suitable information to operating staff or the other related persons visiting the substation, following facilities shall be provided before commissioning of substation or on date of inauguration of the substation.

- Sketch of substations electrical circuit inside the substation in white cotton impregnated 2 mm thick hylum sheet 2x2 feet size installed on the wall,
- Notice board 3x3 feet made out of 10 mm thick water proof ply, painted suitably and provided with 1st class teak wood ribs at the sides of 2 x ½ inches size,
- Electrical safety charts,
- Provision for notifying name, address, telephone numbers, qualification details etc of the operational staff Employer intends to post at the substations and their officials in hierarchy,
- Depicting working drawings of cable terminals details and cable laying details in laminated sheets
- Color coding of bus bars and terminal conductors of the feeders using enamel painting round marks and labeling name of feeders, equipment, etc as defined.

29.00 Labelling:

Each substation equipment shall be labelled using yellow base and black indication marks (number or digits). 40/50 mm height digits/words shall be used for this purpose. Base shall be made using 2 or more coats of yellow enamel paint till good surface finish. Base preparation shall be completed before shifting of poles and equipment to site for erection. Base painting and marking of digits shall be performed by a skilled and trained painter using branded enamel paint, Project Manager shall approve type and brand of enamel paint. The identification of phases through Red, Yellow and Blue circles shall be provided on transformer, CT, PT, 33 kV and 11 kV feeder Double Pole structures.

Control panels shall be labelled from front as well as from the back by providing serial number and name of feeder/transformer. The color coding sign on two adjacent panels shall also be provided with 100mm dia color circle overlapping two adjacent panel sheet for safety purpose.

Labeling of following information is intended by the Employer preferably in local language:

1. Transformer capacity and designated name like T - 1 or T – 2,
2. VCB designated name
3. Identification of CT & PT
4. Color coding of bus bars, transformer terminals, feeders phases (R-Y-B)
5. Name of incoming / outgoing feeder.
6. Warning instruction, if any, of availability of two sources of HT supply on same structure.
7. Earth pit designation and date of checking,

30.00 Danger board:

Each substation equipment and structures shall be provided with a danger board as per IS.

31.00 Site Testing and Pre – Commissioning Checks:

An indicative list of tests is given below. Contractor shall perform any additional test based on specialties of the items as per the Field Quality Plan/ instructions of the equipment manufacturer or Employer without any extra cost to the Employer. The Contractor shall arrange all instruments required for conducting these tests along with calibration certificates and shall furnish the list of instruments to the Employer for approval. Detail test certificates duly signed by Employer's representative & agency representative of tests jointly carried out at site before putting the equipment in use, shall be submitted by the Contractor in three copies.

Agency shall also be responsible to prepare Single Line Diagram of substations and an overall power distribution network. These drawings are not necessarily showing the exact dimensions of the substations.

32.00 Equipment test records, commissioning test records and drawings –

Factory test certificates of equipment, test certificates at the time of pre-dispatch inspections, pre-dispatch inspection reports, pre-commissioning check results and post commissioning check results shall be compiled and provided in three sets to Project Manager for his approval and records.

33.00 Electrical Inspection by state Electrical Inspectorate:

The substations shall be subjected to the inspection of state owned Electrical Inspectorate for which payment of fees shall be made by Employer.

The responsibility of Contractor shall include rectification / alteration / addition of installation as per advice of electrical inspector for successful commissioning of the substations within timelimit.

34.00 Arrangement by the Contractor:

Contractor shall project-wise make his own separate arrangements for the following:

1. Opening of a site office-cum-store,
2. Distributions of power supply at all work areas in the substation premises.
3. Construction of office and store (open & covered)
4. Arranement for fabrication etc.
5. Round the clock fire protection and security arrangements for site store-cum-office during construction stage

35.00 Commissioning spares:

The Contractor shall supply spares, which he expects to consume during installation testing and commissioning of system. The quantity of these spares shall be decided based on his previous experience, such that site works shall not be hampered due to non-availability of these spares.

36.00 Recommended spares:

As/if required will be covered through GTP.

C. **New 11 KV OH Lines**

1.00 GPS Survey

Mapping of route of proposed new 11 kV line by foot GPS Survey be performed mentioning various milestones. While GPS Surveying, existing electrical infrastructure in the locality should also be mapped. Line alignment (single line diagram) on political map with fair correctness, be prepared. SLD and foot GPS Survey report shall be approved by Project Manager and shall be used as basic document for assessment of works under the contract. On completion of line work, as built Single Line Diagram and pole wise line diagram showing pole wise materials used and pole-to-pole span should be submitted to Project Manager. This details shall be used as reference documents by Quality Inspecting officials to execute inspection works.

2.00 Support (pole):

Following types of support are envisaged for 11 KV overhead line:

~~a)~~ 9 Mtr/(W.L-400Kg) PCC Poles.
b) 13 Mtr long WPB 160x160x30.44 kg/m

Precise utilization of type of pole support will depend on site conditions. Cement concrete reinforced plate shall be used as base plate for PCC poles.The size of RCC Base Plate for 9 Mtr PCC Pole which shall be offered for inspection to **WBSEDCL** prior to use. WPB poles shall be cleaned till good surface finish and painted with 2 or more coats of red oxide paint and 2 or more coats of aluminium paint till good finish.

3.00 Fabricated steel items:

Fabricated steel items like top clamp, cross arm, bracket, clamps, cross bracings, bracings, strain plate, guarding channels, back clamp, etc shall be made of MS Channels, MS angle, MS flats as per approved drawings.

While fabricating, good quality electrical cutting tools and drill machine shall be used to ensure no sharp edges and perfect holes as per approved drawings. Gas cutting set should not be used for fabrication of MS steel items. Weld material shall be

distributed equally between the two materials that were joined. The weld shall be free of waste materials such as slag. The weld surface should not have any irregularities or any porous holes (called porosity). The joint shall be tight. Most welds need to demonstrate the required strength. One way to ensure proper strength is to start with a filler metal and electrode rating that is higher than your strength requirement.

The fabricated steel structures materials shall be hot-dip galvanized thoroughly internally and externally according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

4.00 Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of overhead structure items like cross arms, top clamps, brackets, clamps, bracing, strain plates etc.

While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633.

5.00 Stay Set:

Stay set shall be used at all turning locations, conductor dead end supports, double pole structure, triple pole structure, four pole structure to nullify the tension of conductor. Erection of storm guys at suitable location in straight line may also be provided.

6.00 Earthing:

Following earthing arrangements are envisaged for new 11 kV lines:

a) GI Earthing spike made of 20mm solid rod
b) Maintenance free type earthing

Each 11 kV line support shall be provided with one GI earthing spike made of 20 mm solid rod and connected with 6 SWG GI wire. Overhead line structure shall be connected to GI earthing spike using 6 SWG GI wire. GI nuts, bolts & washers shall be used to join two GI wires and 20 mm solid spike rod. Project Manager shall decide use of GI Earth Coil or 20mm dia GI Solid Rod for individual pole earthing.

6 SWG GI wire shall be used for cross lacing and ACSR 20 Sqmmwire shall be used for guard wires.

7.00 Insulator and hardware –

11 KV polymer Disc/Pin insulator with suitable hardware fittings shall be used. Insulator should be tied properly using binding wire & tape/helical form fitting. In road crossing and line crossing locations bridling cross arms and pin insulator shall be used.

The individual insulator shall be checked for insulation resistance before overhead line installation. Insulator should properly be cleaned before installation. No damage/crack insulator should be used.

8.00 ACSR Conductors:

ACSR 50 sq.mm. Rabbit Conductors are envisaged for new 11 kV lines:

Care should be taken while drawing conductor from the drum. Proper roller should be used while handling conductors during erection. Jointing sleeves, binding materials, PG clamps, bi-metallic conductor shall be used for conductor jointing, insulators fixing, jumpering and termination at equipment respectively. There must not be uneven sag between conductor/spans.

Proper sag should be maintained using sag chart table. While tensioning, care should be taken to avoid tension on pin insulator. Therefore, proper alignment of line to be ensured.

At terminal location, care should be taken while connecting two sections to avoid bird faults. Therefore, pin insulator is to be used to handle the conductor on cross channel.

9.00 11 KV AB Switch:

11 kV, 3-ph, 400 A, 3 Pin type, Vertical Mounting type, Gang Operated, AB Switch shall be installed at cut points and at suitable locations as per instructions of Project Manager. AB Switch structure and handle must be earthed using 6 SWG GI wire.

10.00 Anti-climbing device:

3.0 kgs, 2.5mm dia (12 SWG) galvanized barbed wire shall be used on each 11 kV support. Galvanized barbed wire should be properly dressed and crimped at termination. While wrapping the wire on support, proper tension should be maintained.

11.00 Danger board:

Each support shall be provided with a danger board as per IS. Danger board should be in bi-lingual languages (local language and English).

12.00 Support foundation:

Cement concrete in mixture 1 part cement, 3 part coarse sand, 6 part 40 mm size aggregate stone chips (1:3:6) shall be used in H-Beam 11 kV line supports.
PCC pole pit shall be refilled with 200 mm average size of boulder or/and bricks ballast mixed with excavated earth. Proper ramming shall be performed for better compaction.

Muffing shall be provided on WPB poles to prevent direct entry of rain water along the poles. Cement Concrete of 1:2:4 (1 part Cement, 2 parts coarse sand and 4 parts 20mm aggregate stones chips) shall be used for individual poles.

Steel plate shall be used in WPB supports and cement concrete reinforced plate shall be used as base plate for PCC poles.

13.00 Quality & Quantity inspection and compliance to the observation:

The line works, before or after commissioning/energisation, shall be inspected by Quality Inspectors and State Inspection Inspectorate, if required so. Contractor shall provide all requisite details of line like approved GPS Survey report, as built drawings and joint measurement sheet to the inspector to conduct. Contractor shall rectify defects/deficiencies and submit compliance to the observations with supporting photographs in digital form within one month from receipt of observations.

14.00 Tree Trimming:

The Contractor shall arrange tree trimming as required.

15.00 Statutory clearances:

During execution of 11 KV Line work, all statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance, horizontal and vertical clearances from buildings/objects etc. All road crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support.

D. Underground Cabling

1. GPS Survey

The detailed GPS Survey shall be carried out for the approved feeders/spur lines by the Contractor and submitted for Employer's approval. The Successful Tenderer shall carry out radar GPS Survey of the route using Ground penetrating Radar and determine route profile of any other utility cables, pipes etc along the route. The route GPS Survey and drilling profile shall be got approved and finalized by the Engineer-in-Charge prior to commencement of the drilling, HDPE pipe insertion and cable insertion.

2. The scope includes :

- Laying of underground 33 kV, XLPE HT Cable (3Cx400 sqmm)
- Laying of underground 11kV, XLPE HT Cable (3Cx300 sqmm)

Laying of cable shall be as per IS 1255.

3. Details scope of work for Micro-tunneling work with HDPE pipe for Under Ground cable laying

The Micro-tunneling work with HDPE pipe of requiste sizes by Horizontal Direction Drilling method may be done for laying of different sizes of Under ground cables along the route for main crossing point of NH/SH/Metal road, Railway, river/canal, other pipelines / installation of different utility as per direction of Project Manager.

Ground penetrating radar survey along the proposed Micro-tunneling route for identification of underground services is to be adopted during Micro-tunneling work.

Requisite safe drilling inspection pits and test pits whereever necessary are to be executed during Micro-tunneling work.

Guided boaring / drilling technology is to be used.

In Horizontal and Vertical boaring, system should be capable upto 10 meter below ground level.

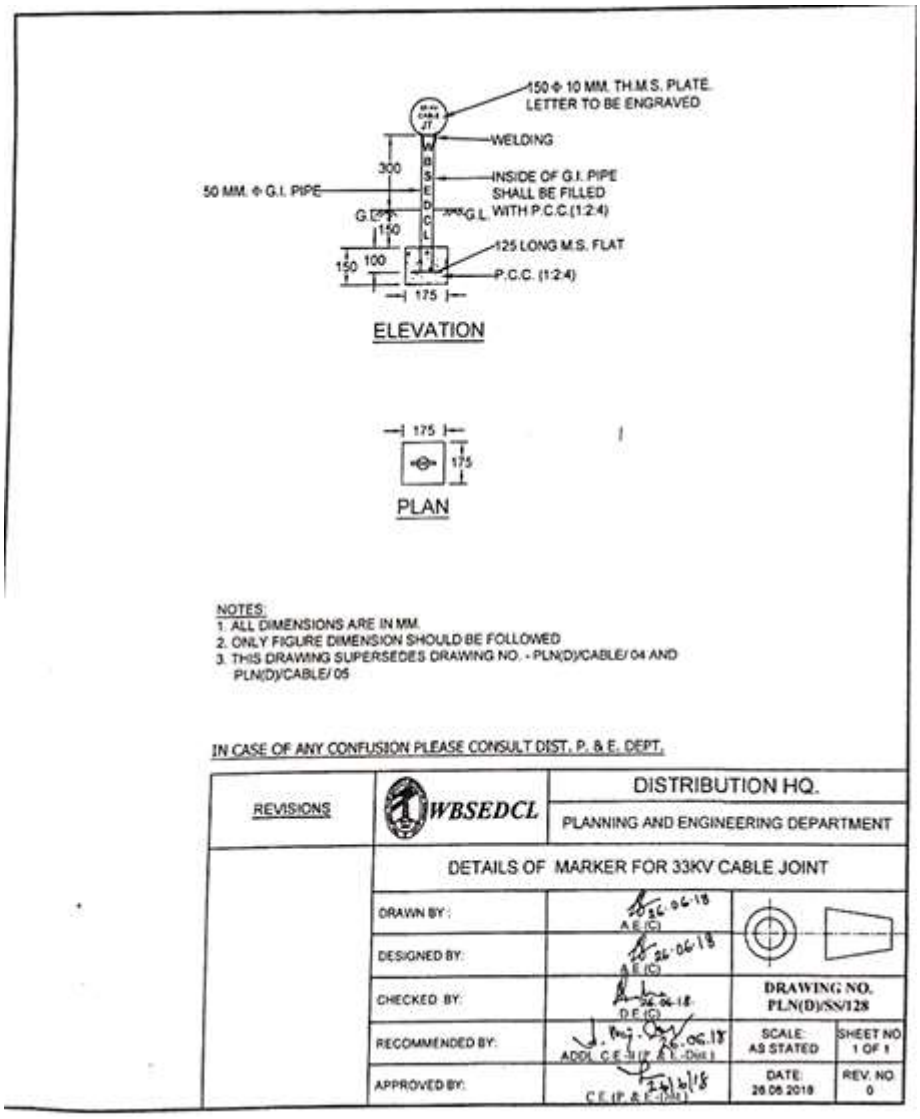
Depth of boaring should be as to clear any underground utilities/obstructions. Minimum depth of boaring for road crossing should be 1.65 meter from the crust level of road. The Micro-tunneling should be atleast 2 meter below the design bed level of the channel/canal.

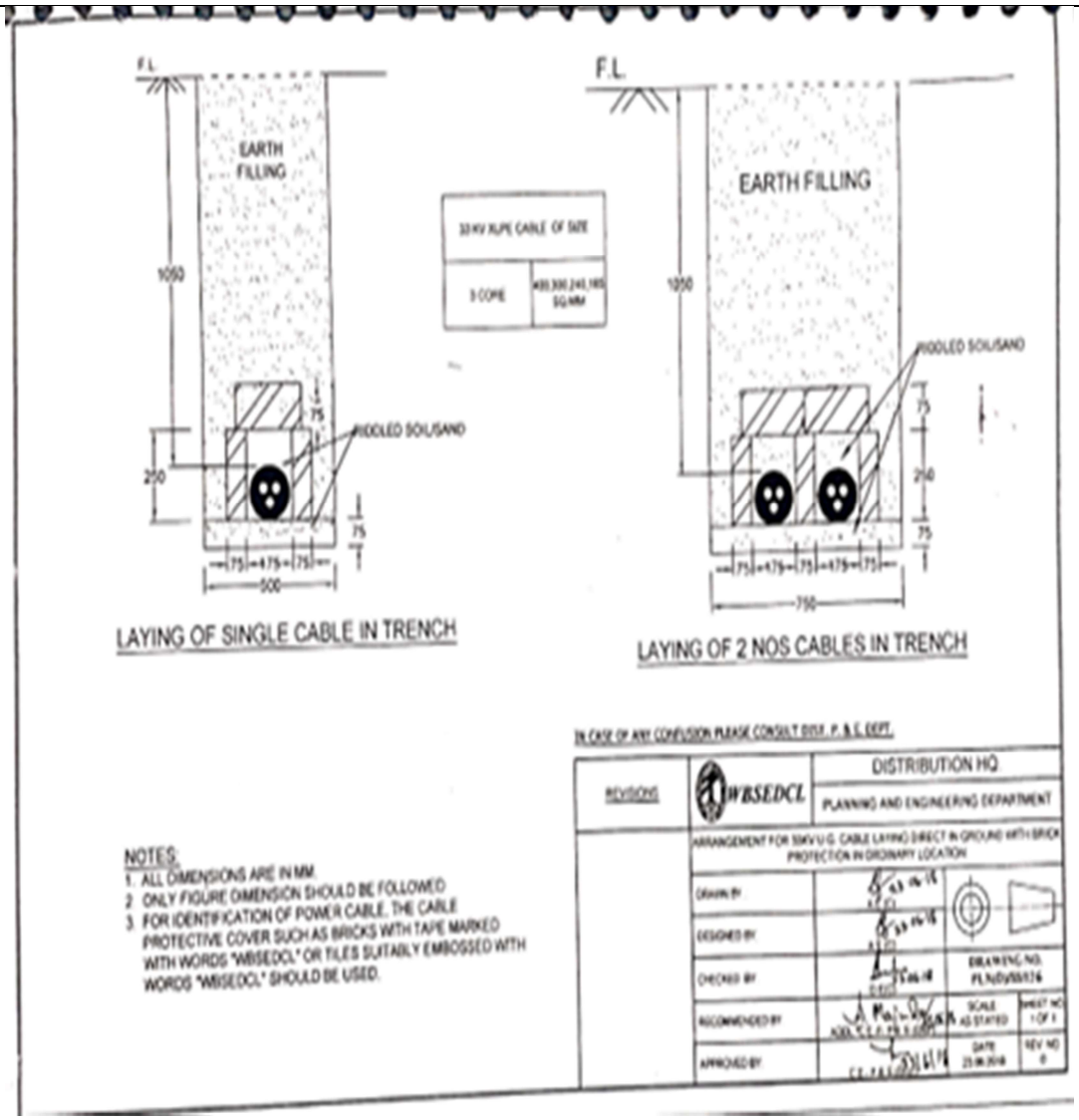
Redio or any other detection system should be used for avoiding damage to existing underground utilities i.e. electric cables, water pipe lines, sewerage line, telecom cables, OFC, gas pipe lines etc.

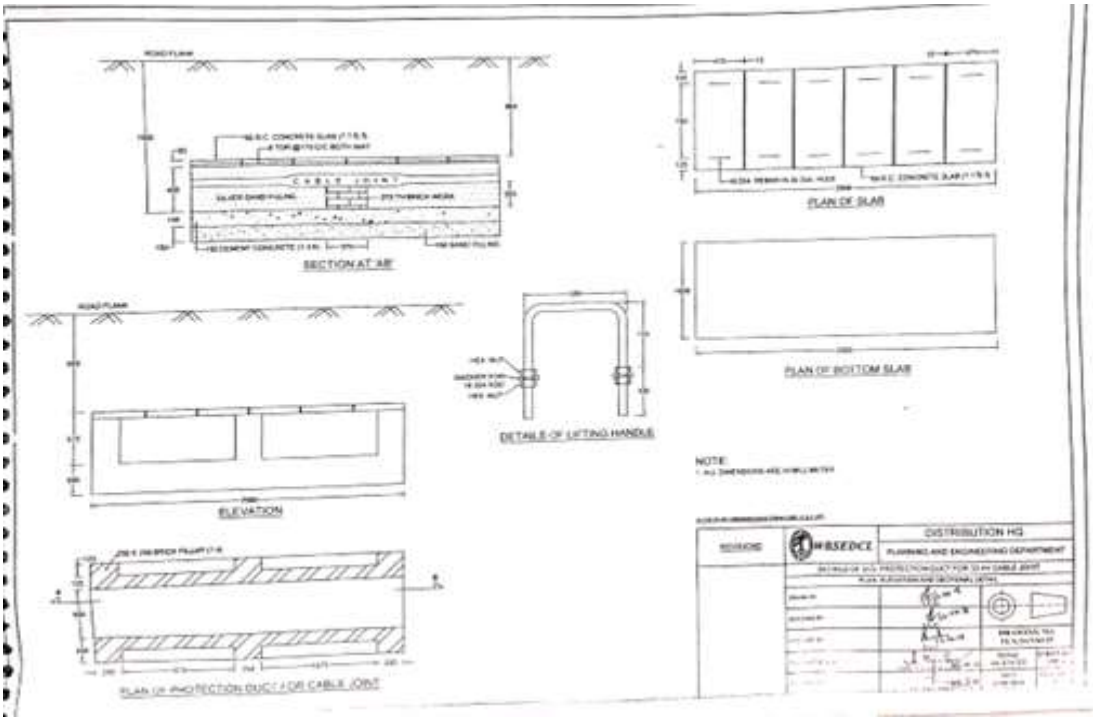
The record of depth of laying of HDPE pipe through Micro-tunneling below the canals / roads/ railway/other utilities should be maintain at an interval of 5 meter.

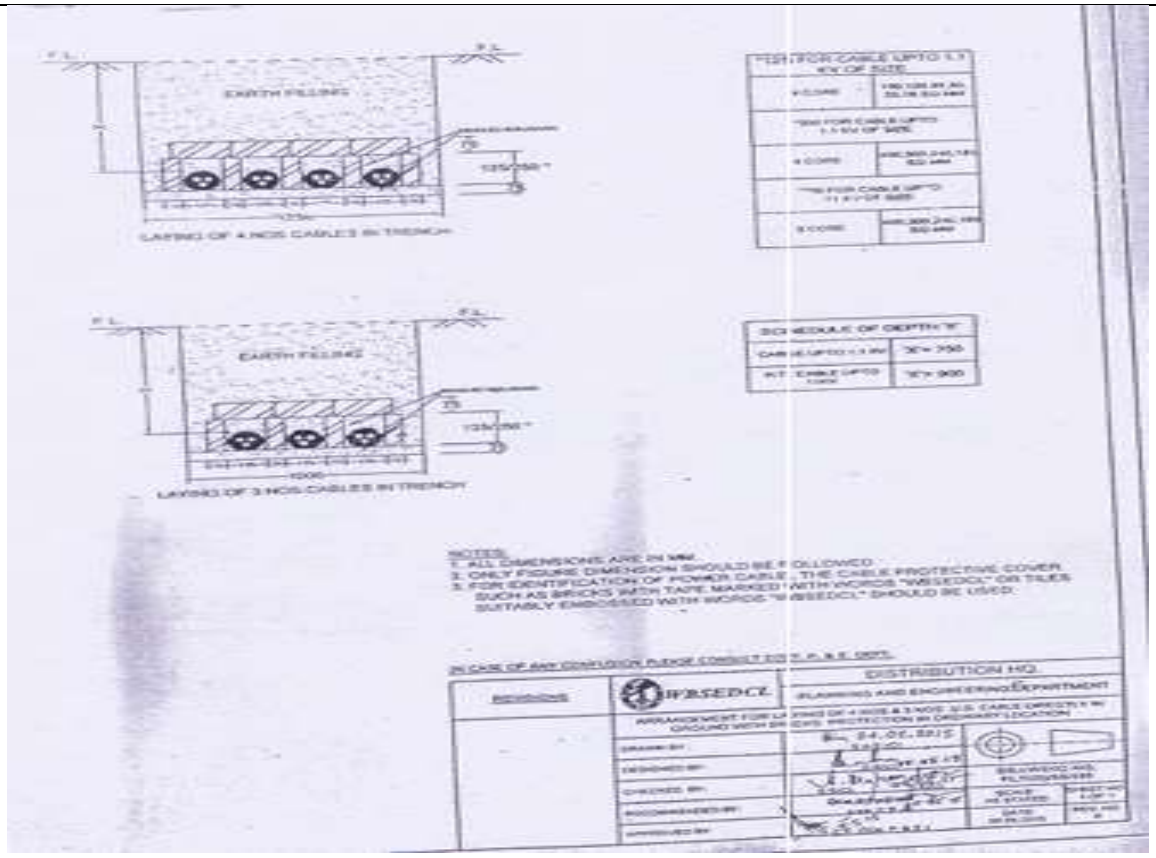
Necessary data from the appropriate different authority for crossing point are to be obtained for Micro-tunneling work with the assistance of WBSEDCL.

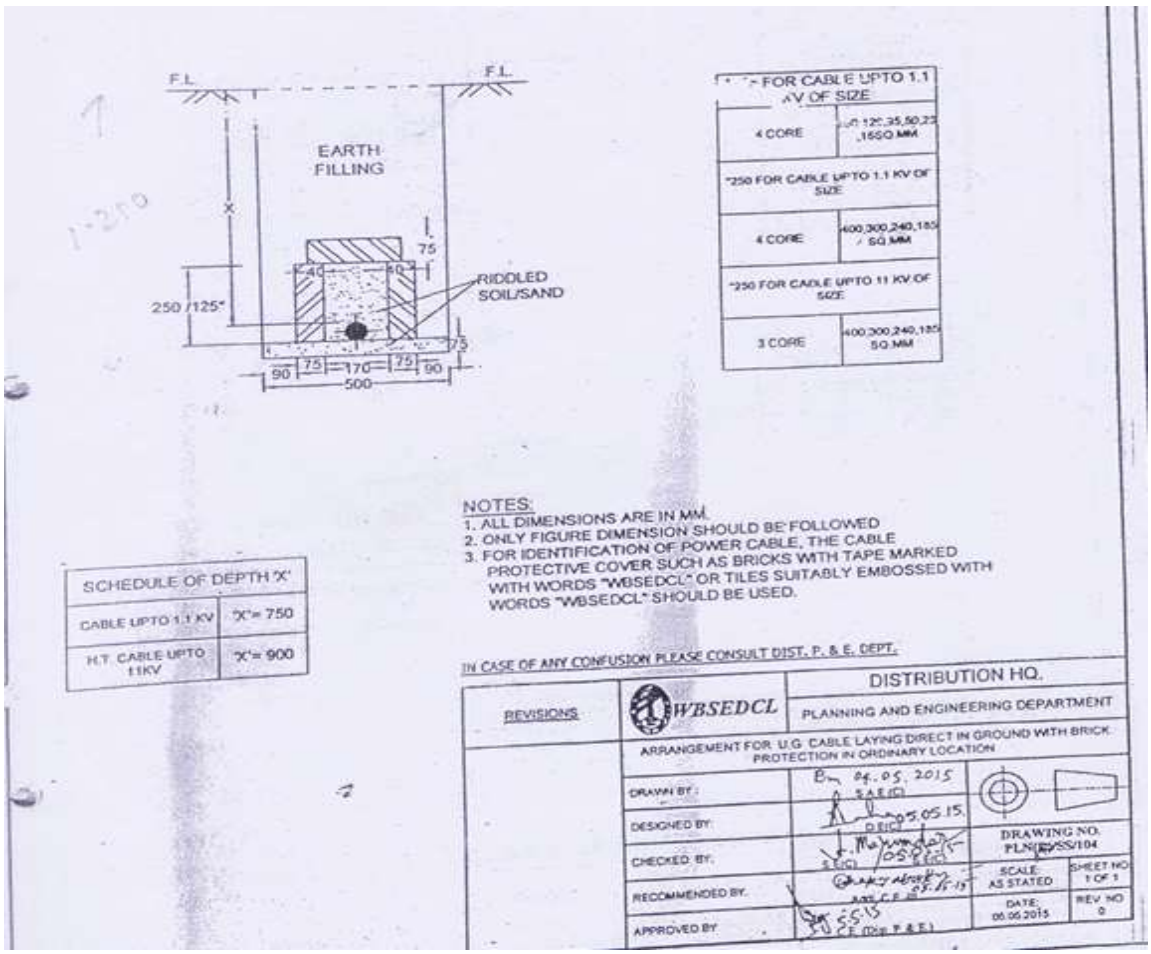
Proposed Micro-tunneling diagram with land mark along with depth profile are to be submitted for obtaining approval from the respective utilities before execution. After execution of Micro-tunneling work route profile are to be submitted for record.




F.L
EARTH FILLING
1050
250
75
SIFTED SOIL/SAND
75
75
475
75
500
LAYING OF SINGLE CABLE IN TRENCH
33 KV XLPE CABLE OF SIZE
3 CORE
300,240,185 SQ.MM
F.L
EARTH FILLING
1050
SIFTED SOIL/SAND
250
75
75
75
475
75
475
75
750
LAYING OF 2 NOS CABLES IN TRENCH
NOTES:
1. ALL DIMENSIONS ARE IN MM.
2. ONLY FIGURE DIMENSION SHOULD BE FOLLOWED.
3. FOR IDENTIFICATION OF POWER CABLE, THE CABLE PROTECTIVE COVER SUCH AS BRICKS WITH TAPE MARKED WITH WORDS "WBSEDCL" OR TILES SUITABLY EMBOSSED WITH WORDS "WBSEDCL" SHOULD BE USED.
IN CASE OF ANY CONFUSION PLEASE CONSULT DIST. P. & E. DEPT.
REVISIONS
WBSEDCL
DISTRIBUTION HQ
PLANNING AND ENGINEERING DEPARTMENT
ARRANGEMENT FOR 33KV U.G. CABLE LAYING DIRECT IN GROUND WITH BRICK PROTECTION IN ORDINARY LOCATION
DRAWN BY
DESIGNED BY
CHECKED BY
RECOMMENDED BY
APPROVED BY
DRAWING NO.
PLN/DIST/074
SCALE
AS STATED
SHEET NO
1 OF 1
DATE
23.06.2016
REV NO
0


SECTION AT AB
PLAN OF SLAB
PLAN OF BOTTOM SLAB
DETAILS OF LIFTING HANDLE
ELEVATION
PLAN OF PROTECTION DUCT FOR CABLE JOINT
NOTE:
REVISIONS
WBSEDCL
DISTRIBUTION HQ
PLANNING AND ENGINEERING DEPARTMENT


EARTH FILLING
75
LAYING OF 4 NOS CABLES IN TRENCH
EARTH FILLING
75
LAYING OF 3 NOS CABLES IN TRENCH
NOTES:
1. ALL DIMENSIONS ARE IN MM.
2. ONLY FIGURE DIMENSION SHOULD BE FOLLOWED.
3. FOR IDENTIFICATION OF POWER CABLE, THE CABLE PROTECTIVE COVER SUCH AS BRICKS WITH TAPE MARKED WITH WORDS "WBSEDCL" OR TILES SUITABLY EMBOSSED WITH WORDS "WBSEDCL" SHOULD BE USED.
IN CASE OF ANY CONFUSION PLEASE CONSULT DIST. P. & E. DEPT.
DISTRIBUTION HQ.
WBSEDCL
PLANNING AND ENGINEERING DEPARTMENT


F.L
F.L
EARTH FILLING
X
75
40
60
RIDDLED SOIL/SAND
250 /125*
90
75
170
75
90
75
500
4 CORE
.16SQ.MM
*250 FOR CABLE UPTO 1.1 KV OF SIZE
4 CORE
/ SQ.MM
*250 FOR CABLE UPTO 11 KV OF SIZE
3 CORE
SQ.MM
SCHEDULE OF DEPTH 'X'
CABLE UPTO 1.1 KV
'X'= 750
H.T. CABLE UPTO 11KV
'X'= 900
NOTES:
1. ALL DIMENSIONS ARE IN MM.
2. ONLY FIGURE DIMENSION SHOULD BE FOLLOWED.
3. FOR IDENTIFICATION OF POWER CABLE, THE CABLE PROTECTIVE COVER SUCH AS BRICKS WITH TAPE MARKED WITH WORDS "WBSEDCL" OR TILES SUITABLY EMBOSSED WITH WORDS "WBSEDCL" SHOULD BE USED.
IN CASE OF ANY CONFUSION PLEASE CONSULT DIST. P. & E. DEPT.
DISTRIBUTION HQ.
REVISIONS
WBSEDCL
PLANNING AND ENGINEERING DEPARTMENT
ARRANGEMENT FOR U.G. CABLE LAYING DIRECT IN GROUND WITH BRICK PROTECTION IN ORDINARY LOCATION
DRAWN BY :
04.05.2015
DESIGNED BY:
05.05.15
CHECKED BY:
05.05.15
RECOMMENDED BY:
05.05.15
APPROVED BY
5.5.15
DRAWING NO.
PLN/DSS/104
SCALE: AS STATED
SHEET NO. 1 OF 1
DATE: 06.05.2015
REV. NO. 0

E. Others

Technical Standards

a. The electrical equipments and materials required during erection should be of high standard. Technical features of these equipments and materials must conform to the technical specification given in this bidding document. Wherever the same is not specified, it must conform to the relevant I.S for that material.
b. Materials conforming to other international standards, which ensure equal or higher quality than the standards mentioned above, shall also be acceptable. In case the bidders who wish to offer materials conforming to other standards, salient points of difference between standards adopted and specific standards shall be clearly brought out in the respective schedule. Four copies of such standards with authentic English version shall be furnished along with the offer.
c. Whenever a material or an article is specified or described by the name of a particular brand, manufacturer or trade mark, the specific item shall be understood as establishing type, function and quality desired. Products of other manufacturers may also be considered, provided sufficient information is furnished, so as to enable the Employer to determine that the products are equivalent to those mentioned.
d. Materials supplied/used shall conform in all respects to the relevant Indian Standard Specification with latest amendments there to.

	Title	IS No.
1.	Cement	IS 269
2.	Steel	IS 6003/1970
3.	Fasteners	IS 6639/1972
4.	Concrete mix	IS 1343
5.	RCC	IS 456
6.	Cable laying and jointing	IS 1255

Installation work pertaining to equipment, cable laying etc should be in accordance with the applicable standards, safety codes etc.

Site Storage/ Transportation

e. It shall be the responsibility of the Contractor to store, move/transport from stores/storage yard etc., relevant items and accessories to the place of installation wherever necessary he will assemble all parts of equipment. In accordance with the specific installation instructions as directed by Site Engineer.
f. The stores should be dismantled and site cleared after the work is completed

Erection, Testing and Commissioning

g. All the works covered under the scope of the tender shall be done in accordance with the norms defined by the Employer, unless the same is not specifically defined in the specification or with the provisions of Indian Electricity Rules/Acts/Other Government Rules/Regulations as prevalent at the time of execution of the job/work.
h. Installation shall be carried out strictly in accordance with the approved drawings Modifications, if any, required to suit site conditions, shall be carried out only with the prior approval of the Site Engineer. All such changes shall be incorporated in "As built" drawings to be furnished by the Contractor.
i. Responsibility for successful installation of other equipment accessories, purchased but not mentioned specifically above, and their commissioning shall be on Contractor. For all such items the Contractor shall be supplying all material and equipment required to accomplish the job complete in all respect.
j. Installation work pertaining to equipment, cable laying etc should be in accordance with the applicable standards, safety codes etc.
k. While Repairing & Replacing the equipment, if any other equipment gets damaged due to negligent handling of the Contractor the same shall be replaced by the Contractor at his cost to the Employer satisfaction.
l. He shall be responsible for dismantling of defective equipments, there proper handling and shifting.
m. The Contractor shall hand over the old & dismantled equipments/ materials to the WBSEDCL's Divisional stores for which no extra payment shall be made.
n. All charges on account of damages/losses/claims/thefts etc. involved under the conditions laid down shall be borne by the Contractor. It's cost shall be recovered from his bills /security deposits /other assets.
o. In order to avoid hazards to personnel moving around, the equipment such as Transformer, Switchgears etc. if required to be kept charged after installation till their commissioning, shall be cordoned off by suitable barriers to prevent accidental injury to personnel moving around.
p. Where the equipments/ assemblies are supplied in more than one part, the Contractor shall make all necessary mechanical and electrical connections between the sections. The Contractor shall also do necessary adjustment in the alignments required for its proper operation.
q. Care shall be taken in handling instruments relays and other delicate devices where instruments and relays are supplied separately they shall be mounted only after the associated switch gear/control panels are erected and aligned.
r. Precaution: The Contractor shall exercise all possible care to avoid damage to public utilities e.g. water/ sewage pipes telephone and power lines/cable already existing. In case of any accidental damage during the work, the Contractor shall be responsible to repair/replace the same at his own cost, and shall ensure that the purchaser is not put to any loss.
s. The Contractor shall have to provide proper lighting, barricading, signboards etc. at the work site as a necessary precautionary arrangement to avoid accident/ damage/ losses to the public /utilities/properties.

t. Space Constraints: While executing the job it is quite possible that some of the specified work may not be carried out due to space/land/ other technical constraints etc. In such case the concerned Employer, if required, may divert this work at some other site or cancel the left over portions of work.

u. The Contractor shall ensure that the equipment under erection as well as the work area and the site are kept clean to the satisfaction of the Engineer. Packing cases and packing materials shall be promptly cleared from sites.

The maximum allowable quantity for consumption of some major materials i.e. conductors, GI wire, Iron materials arising out of sag, jumper, wastage, loop etc.

Description of items	Sectional weight	Allowable quantity for sag, jumper, wastage etc.	Remarks
ACSR 50 sqmm Rabbit		3 %	For HTOH line
ACSR 100 sqmm Dog		3 %	For HTOH line
ACSR 150 sqmm Wolf		3%	For HTOH line
Barbed wire		3.0 kg/ Pole	For HTOH line
GI Stay Wire 7/3.15 mm	0.428 kg/mtr	3 % per stay	Ordinary Stay for 9M PCC Pole-12.5 mtr+3%
			Ordinary Stay for 13M WPB-15 mtr+3%
			Y Stay for 9M PCC Pole-13.5 mtr+3%
			Y Stay for 13M WPB-16 mtr+3%
GI Stay Wire 7/4 mm	0.690 kg/mtr		Ordinary Stay for 9M PCC Pole-12.5 mtr+3%
			Ordinary Stay for 12.8M long Rail Pole/13M WPB-15 mtr+3%
			Y Stay for 9M PCC Pole-13.5 mtr+3%
			Y Stay for 12.8M long Rail Pole /13M WPB-16 mtr+3%
GI Wire 5 mm	0.154 kg /mtr.	3 %	9M PCC Pole Earthing -14 mtr+3%
			9M PCC Double Pole Earthing -30 mtr+3%
			12.8M long Rail Pole /13M WPB Earthing -18 mtr+3%
			12.8M long Rail Pole /13M WPB Double Pole Earthing -35 mtr+3%
			CG lacing-2.8 mtr. /lacing x no of lacing +3%
ACSR 20 sqmm Squirrel		3%	2 x span length + 3% for Cradle guard with 2 lead wire.

F. CIVIL part

Civil works (Annexure-A)

WEST BENGAL STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED	
(A Government of West Bengal Enterprise)	
Schedule of works for Construction of single storied Control Room Building including plumbing works, Structural foundation, boundary wall, cable trench, pathway including switchyard development and sinking of deep tube well with installation of 1HP submersible pump with motor set for proposed 33/11 kV Sub-Station at different district within West Bengal under Project-I,WBSEDCL.	
Sl. No.	**Detail Specification for civil works-(ANNEXURE-A)**
1	Earth work in excavation of foundation trenches or drains in all sorts of soil but excluding laterite or sandstone including removing spreading or stacking the spoils within a lead of 75m. as directed.
2	Earth work in filling in foundation trenches or plinth with good earth in layers not exceeding 150mm including watering and ramming etc.
3	Anti termite treatment to the top surface of the consolidated earth within plinth walls with chemical emulsion by admixing chloropyrofos emulsifiable concentrates (1% concentration) with water by weight at the rate of 5 Litres per sq. m. of the surface before sand bed or sub-grade is laid. Holes up to 50 mm. to 75 mm. deep at 150 mm. centre to centre both ways shall be made with 12 mm, diameter mild steel rod on the surface to facilitate saturation of the soil with the chemical emulsion. The work shall be carried out as per specification described in para 6.4 of code IS-6313 (part -II) 1981. (Mode of measurement will be per Sq.m of plan area of plinth treated.)
4	Treatment to the back filling of R.C.C. foundation with chemical emulsion by admixing chloropyrofos emulsifiable concentrate (1% concentration) with water by weight at the rate of 7.5 ltr. per sq.m. of the vertical surface of the substructure of each side of the foundation. The work shall be carried out as per specification as described in para 6.3.1 of code IS- 6313 (part-II) 1981 (Mode of measurement will be per sq.m. of vertical area of foundation treated)
5	Filling in foundation or plinth by silver sand in layers not exceeding 150mm as directed and consolidating the same by thorough saturation with water, ramming.
6	Filling in foundation plinth by medium coarse sand in layers not exceeding 150mm as directed and consolidating same by thorough saturation with water ramming
7	Earth work in filling of compound, tank, low land, ditches etc with good earth in layers not exceeding 150mm including breaking clods and consolidating the same by ramming and dressing complete.
8	Applying 2 coats of bonding agent with synthetic multifunctional rubber emulsion having adhesive and water proofing properties by mixing with water in proportion (1 bonding agent : 4 water : 6 cement) as per Manufacturer's specification
9	Extra rate for using water proofing and plasticising admixture @ 0.2% by weight of cement (or at manufacturer's specified rate) for concrete of various grades.
10	Dismantling all types of plain cement concrete works, stacking serviceable materials at site and removing rubbish as directed within a lead of 75 m.
11	Dismantling R.C. floor, roof, beams etc. including cutting rods and removing rubbish as directed within a lead of 75 m. including stacking of steel bars.
12	Dismantling all types of masonry excepting cement concrete plain or reinforced, stacking serviceable materials at site and removing rubbish as directed within a lead of 75 m.
13	Taking out carefully G.C.I. or C.I. or asbestos sheets (including ridges etc.) from roof or wall after unscrewing bolts, nuts, screws etc.and stacking the material at site as directed.
14	Single brick flat soling of picked jhama brick including ramming and dressing bed to proper level and filling joints with powdered earth or local sand.
15	Supplying and laying Polythene Sheet (150gm / sq.m.) over damp proof course or below flooring or roof terracing or in foundation or in foundation trenches.
16	Cement concrete with graded stone ballast (40mm size) - i) Pakur variety- 1:3:6 proportion, ii) With N.B. Variety stone metal 1:3:6 proportion for Jalpaiguri & Coochbehar District.
17	Ordinary Cement concrete (mix 1:1.5:3) with graded stone chips (20 mm nominal size) as per relevant IS codes. i) Pakur variety, ii) River Bazree for Jalpaiguri & Coochbehar District.

18	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) as per relevant IS codes. i) Pakur variety, ii) River Bazree for Jalpaiguri & Coochbehar District.
19	Brick work with 1st class bricks in cement mortar(1:6).
20	125mm tick brick work with 1st class bricks in Cement mortar (1:4).
21	Artificial stone in floor, dado, staircase etc. with cement concrete (4:2:1) with stone chips laid in panels as directed with topping made with ordinary or white cement (as necessary) and marble dust in proportion (2:1) including Smooth finishing and rounding off corners and including application of cement slurry before flooring works using cement 1.75 Kg. sq.m all complete including all materials and labours. 3mm thick topping (high polishing grinding on this item is not permitted with ordinary cement).Using grey cement.---35mm thick
22	Supplying, fitting and fixing 1st quality ceramic tiles of any size in walls & floors to match with the existing work & 4 nos. of key stones (10mm) fixed with araldite at the back of each tile & finishing the joints with white cement mixed with coloring oxide if required to match the colours of tiles including roughening of concrete surface, if necessary or by synthetic adhesive & grout materials etc.
	A) Floor- With sand cement mortar (1:4) 20mm thick & 2mm thick cement slurry at back side tiles using cement @2.91kg/m2 & joint filling using white cement slurry @0.20kg/m^2.-Area of each tile above 0.09m^2
	B) Wall- With sand cement mortar(1:3) 15mm thick & 2mm thick cement slurry at back side tiles using cement @2.91kg/m2 & joint filling using white cement slurry @0.20kg/m^2.-Area of each tile above 0.09m^2
23	Supplying and laying 20mm designer chequered tiles of any shade & of approved quality as per IS: 1237:1980 laid in patterns as directed in pavement, footpath etc including necessary underlay 25mm thick(avg.) cement mortar (1:3)complete in all respect with all labour and materials.(Using cement slurry @4.4kg/m2 at back side of tiles).
24	Prefinished and premoulded nosing to treads of steps, railing, window sill etc. of Kota Stone.
25	Wood work in door and window frame fitted and fixed complete including a protective coat of painting at the contact surface of the frame excluding cost of concrete, Iron Butt hinges and M.S. clamps. - Sal: Local
26	Wood work in upper rails of railing, hand rail of staircase, balcony etc. includig necessary bend, moulding fitted and fixed complete
	i) Sishu, Gamar, Champ, Badam, Bhola, Morga, Hallak.
27	Supplying, fitting and fixing M.S. Clamps for fixing door and window frame made of flat bars, end bifurcated with necessary screws etc. by cement concrete (4 : 2 : 1) as per directions. i) 40mm x 6mm, 125mm length
28	Iron (Oxidised) butt hinges of approved quality fitted and fixed with steel screws, with I.S.I. mark
	i) 75mmx40mmx1.12mm.
	ii) 100mmx75mmx3.50mm.
29	Anodized aluminium barrel/tower/socket bolt(full covered) of approved quality manufactured from extruded section conforming to I.S. 204/74 fitted and fixed with Cadmium plated screws.
	i) 100mm long x 10mm dia bolt.
	ii) 200mm long x 10mm dia bolt.
30	Anodized aluminum aldrop/sliding bolts of approved quality manufactured from extruded section conforming to I.S. specification (IS 2681/66) fitted and fixed complete.
	i) 250mm x 16mm dia bolt.
	ii) 300mm x 16mm dia bolt
31	Anodized aluminum 'D' type handle of approved quality manufactured from extruded section conforming to I.S. specification IS 230/72 fitted and fixed complete.With continuous plate base (hexagonal/round rod).
	i) 100mm grip x 10mm dia rod.
	ii) 150mm grip x 10mm dia rod.
32	Steel body foot-door holder.
33	Supplying solid flush type doors of commercial quality, the timber frame consisting of top and bottom rails and side styles of well seasoned timber 65mm wide each and the entire frame fitted with 37.5mm wide battens placed both ways in order to made the door of solid core and internal lapping with Garjan or similar wood veneers using phenol formaldehyde as glue etc. complete including fitting fixing the shutters in position but excluding the cost of hinges and other fittings in round floors. - 32 mm thick shutters (Single leaf).

34	Supplying, Fitting & Fixing Factory made prelaminated P.V.C. door frame of size 50 mmx47 mm with a wall thickness of 5 mm, made out of extruded 5 mm Prelaminated PVC sheet miter cut at two corners and joined with two nos of 1.5 mm long brackets of 15 mm x15 mm M.S. square tube. The two vertical door profiles are to be reinforced with 19 mmx 19 mm M.S. Square tube of 19 gauge, weather seal to be provided through out the frame. The door frame shall be fixed with the wall using 65/100 mm M.S. Screws through the frame by using P.V.C fasteners. A minimum of 4 Nos of screws to be provided for each vertical member and minimum 2 Nos for horizontal member etc.
35	Supplying, fitting & fixing 30mm thick factory made moulding door shutter, consisting of solid core single leaf flash door of 30mm thickness lipped with 15mm (5mmx3) thick x 30mm wide on one style and top rail and 10mm (5mmx2) thick x30 mm wide of the other style and bottom rail. The inner panel laminated with 2mm thick termite proof water proof and fire resistant moulded PVC sheet with raised panel designed in different plain/ or Prelam colour on one side after routing the moulded design on flash door and 2mm plain and or Prelam PVC sheet on other side using rubber adhesive on flash door and solvent cement adhesive on the PVC lipping etc. complete excluding hardwares as necessary as per direction of EIC, Manufacturer's specification and drawing.
	i) Moulded door using 2mm Prelam moulded PVC sheet on both side.
36	M.S. works in brackets made from flats, angles, tees etc. to sizes specialy bent, twisted, forged; making holes drilled and fitted to rafter of trusses with necessary bolts, nuts, washer or screws etc. (length of straight not less than 230 mm).[Page No.-103,Item No.-8 of PWDSOR w.e.f. 01.11.17]
37	M.S.or W.I. Ornamental grill of approved design joints continuously welded with M.S, W.I. Flats and bars of windows, railing etc. fitted and fixed with necessary screws and lugs
	i) Grill weighing above 10 Kg./sq.mtr and up to 16 Kg./sq. mtr.
38	M.S. gate of Jail type as per approved design made of strong M.S. frame work, intermediate stiffeners and round / square bars or angles. M.S. sheet (not less than 14 gauge) gussets, cleats etc. including necessary riveting, bolting, welding, locking and hanging arrangements, fitting and fixing complete as per direction of the Engineer-in -charge.
39	Holding down bolts with nut including 100mmx100mmx6mm plate washers at bottom fitted complete and packing the hole with cement concrete or cement grout as directed.
	i) 20mm dia. bolt 600mm long
	ii) 20mm dia. bolt 300mm long
40	Collapsible gate with 40mm x 40mm x 6mm Tee as top and bottom guide rail, 20mm x 10mm x 2mm vertical channels 100mm apart in fully stretched position 20mm x 5mm M.S. flats as collapsible bracings properly rivetted and washered including 38mm steel rollers including locking arrangements, fitted and fixed in position with lugs set in cement concrete and including cutting necessary holes, chasing etc. in walls, floors etc. and making good damages complete
41	Supplying, fitting and fixing steel rolling shutter profile type with 18 B.G. of approved type, steel latche section 75mm. wide, fitted with coil wire spring to necessitate the fitting of required No. of C.I. pulleys on heavy type solid drawn seamless steel tube complete with locking arrangements both inside and outside specially built up side guide channels including providing a hood for the steel rolling shutter in the room, painting two coats of approved aluminum paint over approved of red lead primer complete.(Payment of painting to be separately) (Measurement will be made on the area of opening covered by the rolling shutter corrected upto 2 decimal.)
42	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and racking out joints including throating, nosing and drip course, scaffolding/staging where necessary after chipping over concrete surface
	With (1:4) cement mortar.
	i) 10 mm thick plaster
	ii) 15 mm thick plaster
	iii) 20 mm thick plaster
43	Neat cement punning about 1.5mm thick in wall, dado, window, sills, floor drain etc. using cement @ 0.152 m3 /100 m^2 .
44	Priming one coat with synthetic oil bound primer of approved quality including smoothening surface by sand papering etc.
	i) On timber or plaster surface.
	ii) Steel or other metal surface.
45	Painting with best quality synthetic enamel paints of approved make and brand including smoothing surface by sand papering etc. including using of approved putty etc. on the surface of necessary.
	a) On timber or plaster surface with super gloss(hi-gloss) of approved quality.

	i) Two coats (with any shade except white.)
	b) On steel or other metal surface with super gloss (hi-gloss) of approved quality.
	i) Two coat (with any shade except white.)
46	Applying decorative cement based paint of approved quality after preparing the surface including scraping the same thoroughly (plastered or concrete surface) as per manufacturer's specification.-One coat on new surface.
47	Applying exterior grade Acrylic primer of approved quality and brand on plastered or concrete surface of old or new surface to receive decorative textured(matt finish) or smooth finish acrylic exterior emulsion paint including scrapping and papering the surface thoroughly, complete as per manufacturer's specification and as per direction of EIC.-one coat
48	Protective and decorative Acrylic exterior paint of approved quality as per manufactures specification and as per direction of E.I.C. to be applied over acrylic primer as required. The rate includes cost of material, labour, scaffolding and all incidental charges but excluding the cost of primer - two coats
	a) Premium 100% Acrylic Emulsion.
49	Rendering the surface of walls and ceiling with white cement based wall putty of approved make and brand(1.5mm thick)
50	Applying interior grade Acrylic primer of approved quality and brand on plastered or concrete surface of old or new surface to receive Distemper/Acrylic emulsion paint including scrapping and papering the surface thoroughly, complete as per manufacturer's specification and as per direction of EIC.
	a) One coat-Solvent based interior grade Acrylic Primer
51	Applying Acrylic Emulsion paint of approved make and brand on walls and ceiling including sand papering in intermediate coats including putty (to be done under specific instruction of Superintending Engineer).
	a) Standard quality-Two coats.
52	Supplying, fitting & fixing UPVC pipes A-Type and fittings conforming to IS:13592-1992 with all necessary clamps nail, including making holes in wall, floor etc. cutting trenches in any soil through masonry concrete structures etc if necessary and mending good damages including joining with jointing materials (Spun Yarn, Valamoid/ Bitumen/ M-Seal etc) complete.
	i) UPVC Pipe-110mm
	ii) UPVC Bend 87.5 degree-110mm
	iii) UPVC Shoe-110mm
53	Supply fitting & fixing of G. I. pipes of TATA make including necessary sockets-for truss work-i) 32mm dia
54	Supplying, fitting & fixing Zn-Al alloy (55% Al & 45% Zn) coating of 150 grams per sq. metre (followed by colour coated on both side) steel sheet work having minimum yield strength of 550 Mpa of trapizoidal profile of approved make as per IS: 15965: 2012 and IS: 14246: 2013 (excluding the supporting frame work) fitted and fixed with 55 mm & 25 mm self tapping screw, EPDM Washer 16 mm dia & 3 mm th. washer etc. complete with 150 mm end lap and one corrugation minimum side lap. (Payment to be made on area of finished work).-In roof- With 0.5 mm thick sheet
55	Supplying , fitting & fixing Zn-Al alloy (55% Al & 45% Zn) coating of 150 grams per sq. metre (followed by colour coated on both side) steel sheet ridging of approved make (excluding the supporting frame work) and fixed with 55 mm & 25 mm self tapping screw, EPDM Washer 16 mm dia & 3 mm th. washer etc. complete with 225 mm end lap and one corrugation minimum side lap.
	i) 150 mm lapping each way-with 0.50 mm sheet.
56	Supplying profiles of required sections made of alluminium alloys extrusions conforming to IS:732-1983 and IS:1285 - 1975 (Annodized with required film thickness and specified colour / natural) matt finished conforming to IS 1868-1983 for fabrication of Composite door , sliding & casement windows , partitions , formed of basic sections of any ISI embossed / certified make and brand as per direction of Engineer in Charge
	I) In 10-20 micron thickness annodizing film-Natural film.
	A) 2- track sliding window
	i) Bottom frame
	ii) Top and side frame.
	B) 3- track sliding window
	i) Bottom frame
	ii) Top and side frame.
	C) Shutter for all track sliding window.

	i) Bottom & Top member.
	ii) Style side member.
	iii) Interlock member.
	D) Casement windows (34 mm depth series)
	i) Outer frame
	ii) Mullion.
	iii) Shutter.
	iv) Glazing clip.
	v) Cleat angle (non anodized)
	E) Movable door shutter.
	a) Door frame (Top & sides).
	b) Shutter
	i) Top Rail.
	ii) Bottom Rail.
	iii) Lock Rail.
	iv) Door Vertical.
	v) Glazing Clip.
	F) Fixed glazing.
	i) Top, Bottom and Side member.
	ii) Intermediate member.
	iii) Glazing clip.
57	Labour charge for fabrication and installation of composite door, window, partitions made from anodized extruded alloy aluminium sections for the following units:-
	A) Glazed aluminium sliding windows made of extruded and anodized alloy aluminium sections, fabrications, including cutting to proper shape and size, drilling and aligning of window and shutter frame fitted with in built looking arrangements, sliding rollers and other necessary fittings, fixture, adhesives and joineries along with extruded neoprene or EPDM gasketing inbetween window frame and masonary with (walls, column, beam, lintels etc.) as well as between stars and frame for fixing glass & poly-Sulphate Sealant and in between shutter and window frame where necessary including cutting to requisite size and fixing the glass as per drawing, specification and direction of E.I.C. The rate includes the hire charges of all tools and plants and all incidental charges, adhesive, joineries such as screw, cleat angle etc. but excludes the cost of extruded aluminium sections, glass, neoprene / EPDM gesketing, locking arrangement and rollers.[Page No.-239,Item No.-2(A) of PWDSOR w.e.f. 01.11.17]
	B) Partly glazed, partly panelled or fully glazed single leaf aluminium swing door made of extruded and anodized alloy Aluminium sections, fabrication, including cutting to proper shape and size, drilling and aligning , fitted with heavy duty hydraulic action floor spring placed in the floor with mending damages, with top pin assembly of approved make and brand, fitted with in built locking arrangements, flush bolt, glazing clips and all other necessary fittings, fixtures, adhesives and joineries, cutting glass of approved make to requisite shape and size fitting with dry set neoprene of EDPM gasketing, cutting to requisite shape and size panel board(prelaminated particle block) fixing them with glazing clips as per drawing, specification and direction of E.I.C.
	i) Double leaf Door with floor spring(fixed with masonry wall)
58	Supplying bubble free floats glass of approved make and brand conforming to IS: 2835-1987.
	i) 4mm thick clear glass.
	ii) 5mm thick clear glass.
59	Supplying EPDM gasket of approved make and brand as per direction of EIC
	i) For sliding windows-U' shaped EPDM gasket for frames.
	ii) Weather gasket/ wool pile
	iii) For openable/ casement windows and door-EPDM/weather gaskets for outer frame and mullion
60	Supplying PVC rollers for sliding windows as per direction of Engineer in charge.
61	Supplying heavy duty hydraulic double action floor spring along with top pin/set at pivots conforming to IS:6315 or any approved make as per direction of E.I.C.
62	Supplying stainless steel functional hinge for casement windows as per approved brand as directed by EIC.(Natural white)

	i) 250mm long
	ii) 300mm long
63	Supplying heavy duty aluminium handle (EBCO Type). [Natural white]
64	Supplying Zinc powered coated star lock (Natural White).
65	Supplying, fitting & fixing Stainless Steel 'D' or 'H' type of size 300 mm x 19 mm tubular Handle with Grade 304, CE certified, marked & conforming to EN -1154, of approved quality of reputed brand as per direction of Eingineer-in-Charge fitted and fixed complete including all incidental charges. -i) Natural colour.
66	Supplying, delivery and spreading approved quality double washed black stone including cost of materials, carriage, loading, unloading all complete including all taxes and duties and incidental charges as per direction of Engineer-In- Charge.(Payment will be made on net volume)
	i) Grade-II aggregates (53-22.4mm) Hand broken aggregates
67	Supplying and laying chequered tiles of any shade & of approved quality with (1:1½:3) cement concrete laid in panels or patterns as directed in pavement, footpath etc. including necessary underlay 25 mm thick [avg] cement mortar (1:3) complete in all respect with all labour and materials. [Using cement slurry @ 4.4 kg/Sq.m at back side and @2.4 kg/Sq.m for joint filling]
	i) Red Variety- 25 mm. thick
68	Supplying fitting and fixing 600 mm (+/- 30 mm) diametre R.B.T (Reinforced Barbed Tape) Concertina fencing on wall top using concertina coils stretched to approx.6 meters length at site clipped with two nos. of horizontal R.B.T strands which will be tensioned and fixed with the vertical M.S angle iron posts by means of security fasteners (such as 'C' clips, R.B.T clips etc.
69	Supplying, fitting and fixing CPVC (Chlorinated Polyvinyl Chloride) pipes of approved make conforming to IS-15778: 2007. with all necessary accessories, specials viz. socket, bend, tee, union, cross, elbo, nipple, longscrew, reducing socket, reducing tee, short piece etc. fitted with holder bats clamps, including cutting pipes, fitting, fixing etc. complete in all respect including cost of all necessary fittings as required, jointing materials in any position above ground. (Payment will be made on the centre line measurements of total pipe line including all all specials. No separate payment will be made for accessories specials. Payment for painting will be made separately.)
	a) For exposed work- CPVC Pipes Class-I,SDR-11
	i) 15mm dia.
	ii) 20mm dia.
	iii) 25mm dia.
	iv) 32mm dia.
	v) 40 mm dia.
	b) For Concealed work- CPVC Pipes Class-I,SDR-11
	i) 15mm dia.
	ii) 20mm dia.
	iii) 25mm dia.
70	Supply of Chlorinated Polyvinyl Chloride (CPVC) Ball valve conforming to IS-15778: 2007
	i) 15mm dia.
	ii) 20mm dia.
	iii) 25mm dia.
	iv) 32mm dia.
	v) 40mm dia.
71	Supplying fitting and fixing bib cock or stop cock
	i) Chromium plated bib cock short body (Equivalent to Code No. 511 & Model – Tropical/Something special of ESSCO or similar brand)
	ii) Chromium plated bib cock long body with wall flange with aerator (Equivalent to Code No. 512 & Model – Tropical/Something special of ESSCO or similar brand)
	iii) Chromium plated stop cock (Equivalent to Code No. 513(A) & 513(B) & Model – Tropical/Something special of ESSCO or similar brand)
	iv) Chromium plated concealed stop cock (Equivalent to Code No. 514(A) & Model – Tropical/ Something special of ESSCO or similar brand)

	v) Chromium plated angular stop cock with wall flange (Equivalent to Code No. 5053 & Model – Florentine of Jaguar or similar brand)
72	Supplying fitting fixing Shower rose of approved brand and make.
	i) Polythene of approved make-15mmx125mm
	ii) Hand Shower (Health Faucet) with 1mtr Fexible Tube with Wall Hook(Equivalent to Code No.573 & Model -ALLIED of Jaquar or similar).
73	Supplying fitting and fixing approved brand P.V.C. connector white flexible, with both ends coupling with heavy C.P. nut 15mm. dia. - i) 750mm long.
74	Supplying, fitting and fixing approved brand 32mm dia. P.V.C. waste pipe with PVC coupling at one end fitted with necessary clampsi) 750mm long.
75	Supplying fitting and fixing 10 liters. P.V.C. low down cistern conforming to I.S. specification with P.V.C. fittings complete, C.I. brackets including two coats painting to bracket etc. White
76	Supplying, fitting and fixing 32 mm dia. flush pipe of approved make with necessary fixing materials and clamps complete.
	i) Polythene flush pipe
77	Supplying, fitting and fixing E.W.C. in white glazed vitreous chinaware of approved make complete in position with necessary bolts, nuts etc.-i) With 'P' trap
78	Supplying, fitting and fixing Closet sheet of approved make with lid and C.P. hinges, rubber buffer and brass screws complete
	i) Plastic white (hollow type)
79	Supplying, fitting and fixing Orissa pattern water closet in white glazed vitreous chinaware of approved make supplied fitted and fixed in position complete excluding 'P' or 'S' trap (excluding cost of concrete for fixing). - i) 580mm x 440mm
80	Supplying, fitting and fixing Flat back urinal (half stall urinal) in white vitreous chinaware of approved make in position with brass screws on 75mm x 75mm wooden blocks complete.
	i) 470 mm X 280 mm X 340 mm
81	Supplying fitting and fixing best quality Indian make mirror 5.5mm thick with silvering as per I.S.I. specification supported on fiber glass frame of any colou, frame size 550mmx400mm.
82	Supplying, fitting and fixing soap holder-PTMT (Prayag or equivalent)
83	Supplying fitting and fixing towel rail with two brackets.
	i) C.P. over brass-25mm dia. and 750mm long.
84	Supplying, fitting and fixing C.I. round grating. i) 100mm.
85	Wash basin vitreous china of approved make (without fittings) supplied,fitted and fixed in position on 75mm X 75 mm X 75 mm wood blocks and C.I. brackets including two coats of painting of C.I. brackets
	i) 450 mm X 300 mm size
	ii) 550mm x 400mm. Size.
86	Supplying, fitting and fixing stainless steel sink complete with waste fittings and two coats of painting of C.I. brackets.
	a) Sink only-630mmx550mmx180mm
87	Supplying, fitting and fixing 15 mm swan neck tap with left & right hand operating nob with aerator (Equivalent to Code No. 510, 510(A) and Model - TROPICAL / SUMTHING SPECIAL of ESSCO or similar brand).
88	Supplying, fitting and fixing pillar cock of approved make- CP Pillar Cock - 15 mm. (Equivalent to Code No. 507 & Model -Tropical / Sumthing Special of ESSCO or similar brand).
89	Supplying, fitting and fixing C.P. Extension Pipe.
90	Supply of UPVC pipes (B type) and fittings conforming to IS: 13592-1992 with labour for fitting and fixing U.P.V.C. pipes for above ground work including cost of jointing materials etc. fitting and fixing all necessary specials, cutting pipes, cutting holes in walls or R.C. floor where necessary and mending good all damages excluding the coat of masonry or concret work, if necessary, but including the cost of fitting and fixing holder bat clamps(any floor) or for underground work including cutting trenches upto 1.5m and refilling the same complete as per direction of EIC.(Payment will be made on center line measurement of the total pipeline including specials).
	a) Above ground -Single socketed 3 meter length-110 mm
	b) Under ground -Single socketed 3 meter length-110 mm
	c) Plain Tee-110 mm

	d) Door Tee-110 mm
	e) Plain Y-110 mm
	f) Bend 87.50-110 mm
	g) Door Bend (TS)-110 mm
	h) Cross Tee with door-110 mm
	j) Vent Cowl-110 mm
	k) Pipe Clip-110 mm
	l) 110x110 P trap-75mm
	m) Passover-110 mm
91	Supplying P.V.C. water storage tank of approved quality with closed top with lid (Black) multilayer. i) 1000 litre Capacity.
92	Labour for hoisting plastic water storage tank.
	a) Upto 1500 litre capacity-i) Upto 3rd story from G.L.
93	Labour for punching hole in P.V.C. water storage tank upto 50mm dia.
94	Constructing inspection pit of inside measurement 600mm x 600mm x upto 600mm with (depth) with 250mm thick 1st class brick work in cement mortar (1:4) on all sides, bottom of the pit consisting of 100mm thick cement concrete (1:3:6) with stone chips over a layer of jhama brick flat soling, 15mm thick (1:4) cement plaster to inside walls and out side walls upto G.L. and 20mm thick(4:1) plaster to bottom of the pit, providing necessary invert with cement concrete (6:3:1) with stone chips as per direction net cement finishing to entire internal surface, top of the pit cover with 100mm thick R.C.C. slab (3:1.5:1)with stone chips and necessary reinforcement upto 1% and shuttering including 6mm thick cement plaster(4:1) in allexternal surface of the slab & one 560mm thick R.C.C. manhole cover of approved makes supplied, fitted & fixed in the slab with necessary fittings, necessary earth work in excavation in all sorts of soil, filling sides of pit, with earth and removing spoils after work complete in all respect with all cost of labour and materials. -i) With Pakur variety. i) With Pakur variety(SAIL/TATA/RINL)
95	Construction of septic tank of different capacities as per approved drawing with 1st class brick work in cement mortar (1:4) including two 560 mm dia. R.C.C. manhole cover(heavy type)of approved make supplied, fitted and fixed in the 100mm thick R.C.C (1:1.5:3) top slab with necessary fittings, 20mm thick cement plaster (4 : 1) with neat cement finish to the internal surfaces and 15 mm thick cement plaster (4 : 1) to outside wall upto 200 mm below G.L floor finished with 25 mm thick grey artificial stone over 100 mm thick R.C.C(1:1.5:3) bottom slab including supplying, fitting and fixing all necessry specials, fittings, S.W. tees, C.I. foot rest etc. including excavation earth in all sorts of soil, shoring, bailing out and pumping out water as necessary, ramming, dressing the bed and fefilling the sides of the tanks with earth, removing spoils, filling up the chamber with clear water, removing foreign aterials from the chamber and including constructing attached inspection pit as per approved drawing and connecting all necessary pipes, joints etc. with internal plaster work and artificial stone flooring is to be done with admixture of water proofing compound @ 0.5% by weight of cement with all costs of labour and materials. Note:- (i) Finished level of Septic Tank should be 400 mm. from Ground Level. (ii) Height of 50 mm. Ventilation pipe &Mosquito proof mesh, should be follwed as per IS:2470, Part-I. Payment will be made separetly on the basis of actual height based on relevant I.S.Code. **i) With Pakur variety(SAIL/TATA/RINL)**-For 10 users
96	Construction of circular soak well 2.5 metre deep in all types of sandy soils with dry brick work upto 1.6 metre from the bottom having 150 mm intermediate cement brick work (1:4) band all round and cement brick work (1:4) upto 0.90 metre from top with 20mm thick cement plastering (1:4) to inside face upto the depth of cement brick work, 15mm thick cement plaster (1:4) on outer face from top of the well upto G.L. and 6 mm thick cement plaster (1:4) on top of the R.C.C. cover slab including filling bottom 1.00 metre of inside of the well with brick metal (50 mm to 63 mm size) including R.C.C. cover slab of 100 mm thick with cement conc (1:1.5:3) with stone chips with necessary reinforcement and shuttering including one 560 mm dia. R.C.C. manhole cover (heavy type)of approved make supplied, fitted and fixed in the cover slab with necessary fittings, making nacessary arrangements for pipe connections, excavation of well including shoring, dewatering and removing the exess earth from the premises as per direction complete in all respect with all costs of labour and materials. With 250 mm thick dry brick work and 250 mm thick cement brick work (1:6) and 1.00m inside dia. **i) With Pakur variety(SAIL/TATA/RINL)** [Page No.-89, Item No.-4 of PWDSOR w.e.f.01.11.17]
97	Labour for boring tube well of required dia. by water jet system through any type of soil strata including hire and labour charges for boring pipes, scaffolding, tools and plants as necessary and taking out them and lowering pipes, strainers, blind pipe etc. and fitting and fixing the same complete including bucket washing and other incidental works in the connection. The tube well should have a minimum 50 mm gap in between the outside of the tubewell pipe and the bore.
	a) For depth upto 150 meter for 50mm dia. tubewell with top enlargement of 100 & 150 mm dia.
	i) 50mm dia. boring.
	ii) 100 mm dia. boring etc. top enlargement.
	b) For depth more than 150 meter for 50mm. dia. tubewell with top enlargement of 100mm dia.

	i) 50mm dia. boring etc. beyond 150 meter.
98	Supply of PVC pipes & fittings Schedule 40 (medium duty) conforming to ASTMD - 1785 and threaded to match with GI Pipes as per IS : 1239 (Part - I)
	a) PVC Pipes
	i) 50 mm dia.
	ii) 100 mm dia.
	b) PVC Socket
	i) 50 mm dia.
	ii) 100 mm dia.
99	Supplying high density polythene strainer of approved make with adapter conforming to I.S. specifications.- i) 50 mm dia.
100	Supplying, fitting & fixing steel cutter piece upto 450 mm long with sockets.- i) 50 mm dia.
101	Supplying M.S. male / female adopter of approved make and brand as per direction of the EIC.- i) 32 mm dia.
102	Supplying, fitting & fixing heavy type bell mouth reducing socket.
	i) 50mm x 100mm
103	Supplying, fitting & fixing G.I. cap at top.- i) 150mm
104	Washing and developing tube well with air compressor pump and engine for 8(eight)hours continuous pumping per day with necessary arrangements for testing the yields in gallons per hour with 'V' notch including hire and labour charges for all tools and plants and scaffolding as required complete in all respect.
105	Labour for making arrangement for showing verticality test including the cost of hire charges of tools and plants, scaffolding, labour etc. all complete.
106	Collecting sample of water for bacteriological and chemical test from any depth at any time during execution of work including hire and labour charges foe tools and plants and sterilization the equipments, paying all charges and fees, testing etc. complete in all respect as per direction.
107	Packing the annular space between the outside of the tube well pipes & strainer and the bore with pea size washed gravel of approved quality having size from 2mm to 5mm or the size approved by the Engineer-In-Charge including cost of all materials, labours and equipment complete.
108	Supplying, fitting & fixing 300 mm M.S. housing clamp of approved quality.
109	Supply, installation and commissioning of KIRLOSKAR/KSB/CROMPTON/CRI/MAHENDRA etc. Submersible Pump, 8-11stage, 1phase/0.75 KW, 1 HP, 220Volts, Head range (65m-26m), Discharge range-(L/PM) (15-45) including control panel board & cost of all materials, taxes and all incidental charges complete.
110	Supplying, fitting and fixing 3 core x 1.5 mm^2 Submersible flat cable including cost of all materials, taxes and all incidental charges complete.
111	Supplying,fitting and fixing check valve (horizontal) G.M. tested to 21 kg per sq. cm.
	i) 32mm dia.
112	Supplying, fitting and fixing porcelain partition wall of approved make of size 618 mm X 310 mm complete in all respect.
113	Providing and fixing exterior quality Aluminium Composite Panel (ACP) wall cladding on existing Al. /MS frame work with GI brackets, ACP fixed on the existing frame work by folding the edges of ACP panel (Engraving the rear surface of ACP sheet) with CP angles, cleats and strainless Steel screws forming groves at the periphery of ACP panel. Such grooves filled with foam and silicon sealant etc. complete with all materials (but including the cost of silicon sealant), labour, scaffolding and all other incidental charges complete in all respect as per specification and direction of Engineer-in-charge. (Mode of payment is on finished surface area of ACP)
	i) 3mm thick (0.25mm Al.+2.5mm LDPE +0.25mm Al. PVDF coating)
114	Any other items not included above will be as per PWDSOR 01.11.17

Annexure-B

Civil Works And Soil Investigation

1.00 General

The provisions of this section of specification shall only be applicable to the extent of scope of works indicated in Bid Proposal Sheet (BPS). The intent of specification covers the following:

Design, engineering, and construction of all civil works at power sub-station, 66 kV line, 33 kV line, 11 kV line, DTR substation, LT line, HVDS, augmentation/renovation of system etc. All civil works shall also satisfy the general technical requirements specified in other Sections of this Specification and as detailed below. They shall be designed to the required service conditions/loads as specified elsewhere in this Specification or implied as per National/ International Standards.

All civil works shall be carried out as per applicable Indian Laws, Standards and Codes. All materials shall be of best quality conforming to relevant Indian Standards and Codes.

The Contractor shall furnish all design, drawings, labour, tools, equipment, materials, temporary works, constructional plant and machinery, fuel supply, transportation and all other incidental items not shown or specified but as may be required for complete performance of the Works in accordance with approved drawings, specifications and direction of Employer.

The work shall be carried out according to the design/drawings to be developed by the Contractor and approved by the Project Manager based on Tender Drawings Supplied to the Contractor by the Project Manager and Original Equipment Manufacturer recommendation. For all buildings, structures, foundations etc. necessary layout and details shall be developed by the Contractor keeping in view the functional requirement of the substation facilities and providing enough space and access for operation, use and maintenance based on the input provided by the Project Manager. Certain minimum requirements are indicated in this specification for guidance purposes only.

In case of R&M of existing substations, Contactor shall visit site to ascertain the amount of repair and strengthening of structures and foundations, dismantling and new construction of structures and foundations works are to be done before quoting. Contractor must furnish the design and drawings in support of the activities mentioned above that are to be carried out in the R&M of existing substation site.

The rate quoted by the bidder for all type of civil work shall be firm irrespective of the type of terrain and depth of filling.

This specification covers all the work required for detailed soil investigation and preparation of a detailed report. The work shall include mobilisation of necessary equipment, providing necessary engineering supervision and technical personnel, skilled and unskilled labour etc. as required to carry out field investigation as well as, laboratory investigation, analysis and interpretation of data and results, preparation of detailed Geo-technical report including specific recommendations for the type of foundations and the allowable safe bearing capacity for different sizes of foundations at different founding strata for the various structures of the substation. The Contractor shall make his own arrangement for locating the co-ordinates and various test positions in field as per the information supplied to him and also for determining the reduced level of these locations with respect to the benchmark indicated by the Project Manager.

All the work shall be carried out as per latest edition of the corresponding Indian Standard Codes.

a. Geotechnical Investigation

The Contractor shall perform a detailed soil investigation to arrive at sufficiently accurate, general as well as specific information about the soil profile and the necessary soil parameters of the site. So that the foundation of the various structures can be designed and constructed safely and rationally.

A report to the effect will be submitted by the Contractor for Project Manager's specific approval giving details regarding data proposed to be utilized for civil structures design.

The Contractor should visit the site to ascertain the soil parameters before submitting the bid. The topography is uneven steeply sloping at few places requiring cutting and filling operations including slope stability and protection measures (if slopes encountered). Any variation in soil data shall not constitute a valid reason for any additional cost & shall not affect the terms & condition of the Contract. Tests must be conducted under all the critical locations i.e. Control Room Building. Tower locations, transformer etc.

b. Bore Holes

Drilling of bore holes of 150 mm dia. in accordance with the provisions of IS: upto 10 m depth or to refusal which ever occur earlier. (By refusal it shall mean that a standard penetration blow count (N) of 100 is recorded for 30 cm penetration). For a new substation, minimum three (3) bore holes shall be done to find out the geological profile of the area. If any unconformity encountered then more bore holes shall be drilled with the approval of Project Manager for the new projects. However in case deep pile foundations are envisaged the depths have to be regulated as per code provisions. In cases where rock is encountered, coring in one borehole per bay shall be carried out to 1.5 M in bedrock and continuous core recovery is achieved.

Performing Standard Penetration Tests at approximately 1.5 m interval in the borehole starting from 1.5 m below ground level onwards and at every change of stratum. The disturbed samples from the standard penetrometer shall also be collected for necessary tests.

Collecting undisturbed samples of 100/75 mm diameter 450 mm long from the boreholes at intervals of 2.5 m and every change of stratum starting from 1.0 m below ground level onwards in clayey strata.

The depth of Water table shall be recorded in each borehole.

All samples, both disturbed and undisturbed, shall be identified properly with the borehole number and depth from which they have been taken.

The sample shall be sealed at both ends of the sampling tubes with wax immediately after the sampling and shall be packed properly and transported to the Contractor's laboratory without any damage or loss.

The logging of the boreholes shall be compiled immediately after the boring is completed and a copy of the bore log shall be handed over to the Project Manager.

c. Electrical Resistivity Test

This test shall be conducted to determine the Electrical resistivity of soil required for designing safe grounding system for the entire station area. The specifications for the equipments and other accessories required for performing electrical resistivity test, the test procedure, and reporting of field observations shall confirm to IS: 3043. The test shall be conducted using Wagner's four electrode method as specified in IS: 1892, Appendix-B2. Unless otherwise specified at each test location, the test shall be conducted along two perpendicular lines parallel to the coordinate axis. On each line a minimum of 8 to 10 readings shall be taken by changing the spacing of the electrodes from an initial small value of 0.5 m upto a distance of 10.0 m.

d. Water Sample

Representative samples of ground water shall be taken when ground water is first encountered before the addition of water to aid drilling of boreholes. The samples shall be of sufficient quantity for chemical analysis to be carried out and shall be stored in airtight containers.

e. Back Filling of Bore Holes

On completion of each hole, the Contractor shall backfill all bore holes as directed by the Project Manager. The backfill material can be the excavated material and shall be compacted properly.

f. Laboratory Test

1. The laboratory tests shall be carried out progressively during the field work after sufficient number of samples have reached the laboratory in order that the test results of the initial bore

holes can be made use of in planning the later stages of the field investigation and quantum of laboratory tests.

2. All samples brought from field, whether disturbed or undisturbed shall be extracted/prepared and examined by competent technical personnel, and the test shall be carried out as per the procedures laid out in the relevant I.S. Codes.

The following laboratory tests shall be carried out

a) Visual and Engineering Classification
b) Liquid limit, plastic limit and shrinkage limit for C-□ soils.
c) Natural moisture content, bulk density and specific gravity.
d) Grain size distribution.
e) Swell pressure and free swell index determination for expensive soil only.
f) Consolidated un-drained test with pore pressure measurement.
g) Chemical tests on soil and water to determine the carbonates, sulphates, nitrates, chlorides, Ph value, and organic matter and any other chemical harmful to the concrete foundation.
h) C.B.R value
i) Rock quality designation (RQD), RMR in case of rock is encountered

2.00 Test Results and Reports

1. The Contractor shall submit the detailed report in two (2) copies wherein information regarding the geological detail of the site, summarized observations and test data, bore logs, and conclusions and recommendations on the type of foundations with supporting calculations for the recommendations. Initially the report shall be submitted by the Contractor in draft form and after the draft report is approved, the final report in two (3) copies shall be submitted. The test data shall bear the signatures of the Investigation Agency, Vendor and also site representative of Employer.

2. The report shall include but not limited to the following:

i. A plan showing the locations of the exploration work i.e. bore holes, dynamic cone penetration tests etc.

ii. Bore Logs: Bore logs of each bore holes clearly identifying the stratification and the type of soil stratum with depth. The values of Standard Penetration Test (SPT) at the depths where the tests were conducted on the samples collected at various depths shall be clearly shown against that particular stratum.

Test results of field and laboratory tests shall be summarised strata wise as well in combined tabular form. All relevant graphs, charts tables, diagrams and photographs, if any, shall be submitted along with report. Sample illustrative reference calculations for settlement, bearing capacity, pile capacity shall be enclosed.

a. Recommendations: The report should contain specific recommendations for the type of foundation for the various structures envisaged at site. The Contractor shall acquaint himself

about the type of structures and their functions from the Project Manager. The observations and recommendations shall include but not limited to the following:

i. Geological formation of the area, past observations or historical data, if available, for the area and for the structures in the nearby area, fluctuations of water table etc. Slope stability characteristics and landslide history of the area shall be specifically highlighted. Remedial measures to be adopted shall also be given.

ii. Recommended type of foundations for various structures. If piles are recommended the type, size and capacity of pile and groups of piles shall be given after comparing different types and sizes of piles and pile groups.

iii. Allowable bearing pressure on the soil at various depths for different sizes of the foundations based on shear strength and settlement characteristics of soil with supporting calculations. Minimum factor of safety for calculating net safe bearing capacity shall be taken as 3.0 (three). Recommendation of liquefaction characteristics of soil shall be provided.

iv. Recommendations regarding slope of excavations and dewatering schemes, if required. Required protection measures for slope stability for cut & fill slopes of switchyard and approach road with stone pitching/retaining walls shall be clearly spelt out. Calculation shall also be provided for stability adequacy.

v. Comments on the Chemical nature of soil and ground water with due regard to deleterious effects of the same on concrete and steel and recommendations for protective measures.

vi. If expansive soil is met with, recommendations on removal or retaining the same under the structure, road, drains, etc. shall be given. In the latter case detailed specification of any special treatment required including specification or materials to be used, construction method, equipment to be deployed etc. shall be furnished. Illustrative diagram of a symbolic foundation showing details shall be furnished.

vii. Recommendations for additional investigations beyond the scope of the present work, if considered such investigation as necessary.

3.00 Site Preparation

The Employer shall be responsible for proper leveling of switchyard site as per layout and levels of switchyard finalized during detailed engineering stage. The Employer at his own cost shall make the layout and levels of all structure etc from the general grids of the plot and benchmarks set and approved by the Project Manager. The Contractor shall give all help in instruments, materials and personnel to the Project Manager for checking the detailed layout and shall be solely responsible for the correctness of the layout and levels. Site leveling shall be in the scope of the Employer. Bidder may decide the level of the sites. However, the level shall be such that it is 300 mm higher than the highest flood level (HFL) of the site. If HFL is not available, then nearby road level shall be assumed as HFL.

Whenever for bay extension works the existing substation are to be modified or strengthen, Contractor should keep same as EGL of existing sub-station so that FFL shall be same for both and all the necessary arrangements are to be carried out in this regard by the Contractor.

This clause covers the design and execution of the work for site preparation, such as clearing of the site, the supply and compaction of fill material, slope protection by stone pitching/retaining walls depending on the site location & condition, excavation and compaction of backfill for foundation, road construction, drainage, trenches and final topping by brick soling/stone filling.

1) The Employer shall develop the site area to meet the requirement of the intended purpose. The site preparation shall conform to the requirements of relevant sections of this specification or as per stipulations of standard specifications. Employer shall also carry out necessary protection of slope of switchyard area and approach road.

2) The fill material if required shall be suitable for the above requirement. The fill shall be such material and the site so designed as to prevent the erosion by wind and water of material from its final compacted position or the in-site position of undisturbed soil.

3) Material unsuitable for founding of foundations shall be removed and replaced by suitable fill material and to be approved by the Project Manager.

4) Backfill material around foundations or other works shall be suitable for the purpose for which it is used and compacted to the density described under Compaction. Excavated material not suitable or not required for backfill shall be disposed off in areas as directed by Project Manager upto a maximum lead of 1 km.

a. Excavation and backfill

1. Excavation and backfill for foundations shall be in accordance with the relevant code.

2. Whenever water table is met during the excavation, it shall be dewatered and water table shall be maintained below the bottom of the excavation level during excavation, concreting and backfilling.

3. When embankments are to be constructed on slopes of 15% or greater, benches or steps with horizontal and vertical faces shall be cut in the original slope prior to placement of embankment material. Vertical faces shall measure not more than 1 m in height.

4. Embankments adjacent to abutments, culverts, retaining walls and similar structures shall be constructed by compacting the material in successive uniform horizontal layers not exceeding 20 cm in thickness (of loose material before compaction). Each layer shall be compacted as required by means of mechanical tampers approved by the Project Manager. Rocks larger than 10 cm in any direction shall not be placed in embankment adjacent to structures.

5. Earth embankments of roadways and site areas adjacent to buildings shall be placed in successive uniform horizontal layers not exceeding 20 cm in thickness in loose stage measurement and compacted to the full width specified. The upper surface of the embankment shall be shaped so as to provide complete drainage of surface water at all times.

6. The land required for borrowing earth shall be arranged & selected by Contractor. The identified land shall be got approved by Project Manager. The quoted rates shall include cost of earth, taxes, duties, royalty, compensation for the land identified for borrow earth. The rate shall also be inclusive of all leads, lifts, ascent, descent and testing required for completion of work in all respect.

7. The ground levels for all measurements shall be taken at every 5 meter distance in uniformly sloping ground and at closer distance where pits/undulations are met with. In fairly leveled area, levels shall be taken at 15 mt. apart at the discretion of Project Manager. The ground levels shall be recorded and plotted on plans. The same shall be recorded by Project Manager before the earth work is started. All labor, material, tool, equipment etc required for the above work shall be arranged by the Employer at his own cost.

b. Compaction

1. The density to which fill materials shall be compacted shall be as per relevant IS and as per direction of Project Manager. All compacted sand filling shall be confined as far as practicable. Backfilled earth shall be compacted to minimum 95% of the Standard Proctor's density at OMC. The sub-grade for the roads and embankment filling shall be compacted to minimum 95% of the Standard Proctor's density at OMC. Cohesion less material sub grade shall be compacted to 70% relative density (minimum).

2. At all times unfinished construction shall have adequate drainage. Upon completion of the road's surface course, adjacent shoulders shall be given a final shaping, true alignment and grade.

3. Each layer of earth embankment when compacted shall be as close to optimum moisture content as practicable. Embankment material, which does not contain sufficient moisture to obtain proper compaction, shall be wetted. If the material contains any excess moisture, then it shall be allowed to dry before rolling. The rolling shall begin at the edges overlapping half the width of the roller each time and progress to the center of the road or towards the building as applicable. Rolling will also be required on rock fills. No compaction shall be carried out in rainy weather.

c. Requirement for fill material under foundation

All foundations shall rest below virgin ground level and the minimum depth of foundation below the virgin ground level shall be at least 500 mm. For small equipment and minor foundations like marshalling kiosk, Switch board stand, earth switch and main box support etc. may be reduced to 300 mm with specific approval of the Project Manager.

4.00 Stone Filling & Antiweed Treatment

The Contractor shall furnish all labour, equipment and materials required for complete performance of the work in accordance with the drawings, specification and direction of the Project Manager.

Stone filling shall be done in the areas of the switchyard wherever equipment and or structures are to be provided under present scope of work covering entire fencing area.

Prevailing practice of stone filling is to be adopted for the bay extension works of existing substations. Contractor shall verify the existing practice prevailing at site before quoting.

Before taking up stone rolling, antiweed treatment shall be applied in the switchyard area where stone filling is to be done and the area shall be thoroughly de-weeded including removal of the roots. The recommendation of local agriculture/horticulture department shall be sought where ever feasible while choosing the type of chemical to be used. Nevertheless the effectiveness of chemical shall be demonstrated by the Contractor in a test area of size 10 meterx 10 meter (approx..). The final approval based on the result shall be given by Project Manager. Antiweed treatment shall be procured from reputed manufacturer. The dosage and application of chemical shall be strictly as per the manufacturer's recommendation. The Contractor shall be requested to maintain the area free of weed for a period of one year from the date of application of the first dose of the chemical.

5.00 General Requirement

a. The material required for site surfacing shall be free from all types of organic materials and shall be of standard quality, and as approved by the Project Manager.

The material to be used for stone filling/ site surfacing shall be uncrushed/ crushed/ broken stone of 20 mm nominal size (single sized) conforming to table 2 of IS: 383- 1970. Hardness, flakiness shall be as required for wearing courses are given below.

(a) Sieve analysis limits/Gradation

Sieve size	% passing by weight
40mm	100
20mm	85-100
10mm	0-20
4.75mm	0-5

(b) Hardness
Abrasion value (IS: 2386 part-IV) not more than 40%
Impact value (IS: 2386 part-IV) not more than 30%

(c) Flakiness Index
As per (IS: 2386 part-IV) and maximum value is 25.

b. After all the structures/equipment are erected, the surface of the switchyard area shall be maintained, rolled/compacted to the lines and grades as decided by Project Manager. De-weeding including removal of roots shall be done before rolling is commenced. Project Manager shall decide final formation level so as to ensure that the site appears uniform. The final formation level shall however be very close to the formation level indicated in the drawing using half-ton roller with suitable water sprinkling arrangement to form a smooth and compact surface.

c. A base layer of uncrushed/crushed/broken stone of 20 mm nominal size (single sized) shall be spread and rolled/compacted by using half ton roller with 4 to 5 passes and water sprinkling to form a minimum 50 mm layer on the finished ground level of the specified switchyard area excluding roads, drains, cable trench and tower and equipment foundations as indicated in the drawing.

d. Over the base layer of site surfacing material, a final surface course of minimum 50 mm thickness of 20 mm nominal size (single sized) broken stone as specified above shall be spread and compacted by light roller using half tones steel roller (width 30" and 24" dia meter) with water sprinkling as directed by the Project Manager. The water shall be sprinkled in such a way that bulking does not take place.

e. In areas that are considered by the Project Manager to be too congested with foundations and structures for proper rolling of the site surfacing material by normal rolling equipment, the material shall be compacted by hand, if necessary. Due care shall be exercised so as not to damage any foundation structures or equipment during rolling compaction.

6.00 Site Drainage

a. Adequate site drainage system shall be provided by the Contractor in new and existing substation. In case of bay extension of existing substation, drainage layout shall be prepared by the Contractor in such away that it should satisfy the technical parameters stated below while designing the drainage system so that flow of water of the existing part of substation remain uninterrupted and the same should be approved by the Project Manager. The technical parameters stated below also to be taken into account while designing the drainage system for new substation as well.

The Contractor shall obtain rainfall data and design the storm water drainage system, (culverts, ditches, drains etc.) to accommodate run off due to the most intense rainfall that is likely to occur over the catchments area in one hour period on an average of once in ten years. The surface of the site shall be sloped to prevent the ponding of water.

b. The maximum velocity for pipe drains and open drains shall be limited to 2.4m/sec and 1.8m/sec respectively. However, minimum non-silting velocity of 0.6m/sec shall be ensured. Longitudinal bed slope shall not be milder than 1 in 1000.

c. The drains shall be constructed using Brick masonry except at road crossings etc. where RCC pipe shall be used. The RCC pipe for drains and culverts shall be as per IS:456 and IS:783.

d. The Contractor shall ensure that water drains are away from the site area and shall prevent damage to adjacent property by this water. Adequate protection shall be given to site surfaces, roads, ditches, culverts, etc. to prevent erosion of material by water.

e. The drainage system shall be adequate without the use of cable/pipe trenches. (Pipe drains shall be provided in areas of switchyard where movement of crane will be necessary in operating phase of the substation).

f. For pipe drains, concrete pipe of class NP2 shall be used. However, for road crossings etc. higher strength pipe of class NP3 shall be provided. For rail crossings, pipes conforming to railway loading standards or at least NP4 class shall be provided. Manholes shall be provided at every 30m interval, at connection points and at every change of alignment.

g. Open surface drains for new s/s shall be provided with brick masonry in 1:6 (1 cement: 6 coarse sand) cement mortar with 15 mm thick, 1:4 (1 cement: 4 sand) cement plaster inside and exposed surface of drains as per approved drawing. For bay extension at existing substations, prevailing practice of the respective substation shall be adopted.

h. Pipe drains shall be connected through manholes at an interval of max. 30m. Effluents shall be suitably treated by the Contractor to meet all the prevalent statutory requirements and local pollution control norms and treated effluents shall be conveyed to the storm water drainage system at a suitable location for its final disposal.

i. Invert of the drainage system shall be decided in such a way that the water can easily be discharged above the High Flood Level (HFL) outside substation boundary at suitable location up to a maximum 50M beyond boundary wall of substation or actual whichever occurs earlier and approved by Project Manager.

j. All internal site drainage system, including the final connection/disposal to Project Manager acceptance points shall be part of Supplier's scope including all required civil works. The Contractor shall connect his drain(s) at one or more points to outfall points as feasible at site.

k. The drainage scheme and associated drawings shall be got approved and constructed as per enclosed tender drawing.

7.00 Roads and Culverts inside substation premises

a. The main approach road including modification of existing road to meet the site conditions, roads for access to equipment and buildings with in substations (including bay extension in existing substations) are in the scope of the Contractor. Layout of the roads shall be based on General detail & Arrangement drawing for the substation. If extra road is required for functional point of view, which has not been mentioned in the layout drawing, Contractor should provide the same without extra cost to the Project Manager.

b. All substation roads shall be constructed so as to permit transportation of all heavy equipment. The roads shall have min. 3.0 m wide RCC road as per enclosed tender drawing.

c. Road construction shall be as per IRC standards.

d. Adequate provision shall be made for road drainage. Protection of cut and embankment slopes of roads as per slope stability requirement shall be made.

e. All the culverts and its allied structure (required for road/rail, drain trench crossings etc.) shall be designed for class A loading as per IRC standard / IS code and should be checked for loading.

f. All roads shall be designed for class 'D' of traffic as per IRC-37 Guide-lines for the design of rigid pavements.

8.00 Transformer Foundation

The Contractor shall provide a road system integrated with the transformer foundation to enable installation and the replacement of any failed unit by the spare unit located at the site. This system shall enable the removal of any failed unit from its foundation to the nearest road.

If existing/failed transformer is required to be replaced by new one in augmentation/bay extension works of existing substations then the foundation supporting that equipment shall be strengthen by modifying the foundation itself or the foundation shall be dismantle and recast new foundation as per site conditions. However, Contractor must furnish the design calculation incorporating all those changes so that safety of the structure and foundation remain adequate.

Similarly all types of equipment foundations with /without supporting structures shall be treated in similar manner as stated for transformer foundations.

Contractor must access the amount of work involve for augmentation/bay extension of existing substations while quoting.

9.00 Cable & Pipe Trenches

a. The cable trenches and precast removable RCC cover (with lifting arrangement) shall be constructed using RCC of M20 grade for new substation whereas for bay extension of existing substation size and material of cable trenches shall be same as the existing one and pre-cast removable RCC cover (with lifting arrangement) shall be constructed using RCC of M20 grade. Cable trenches must be designed for the design criteria stated below, whether it is of concrete or brick for both new substations and bay extension works in existing substations.

b. The cable trench walls shall be designed for the following loads.

(i) Dead load of 100 kg/m length of cable support + 75 Kg on one tier at the end.
(ii) Triangular earth pressure + uniform surcharge pressure of 1T/m2.

c. Cable trench covers shall be designed for self-weight of top slab + concentrated load of 200 kg at center of span on each panel.

d. Cable trench crossing the road/rails shall be designed for class A. Loading of IRC/relevant IS Code and should be checked for transformer loading.

e. Trenches shall be drained. Necessary sumps be constructed and sump pumps if necessary shall be supplied. Cable trenches shall not be used as storm water drains.

f. The top of trenches shall be kept at least 100 mm above the finished ground level for the new substation. The top of cable trench shall be such that the surface rainwater does not enter the trench.

g. The top of trench shall be kept same as existing one to maintain uniformity of the cable trenches structure in case of bay extension works of existing substations.

h. All metal parts inside the trench shall be connected to the earthing system.

i. Cables from trench to equipment shall run in hard conduit pipes.

j. Trench wall shall not foul with the foundation. Suitable clear gap shall be provided.

k. The trench bed shall have a slope of 1/500 along the run & 1/250 perpendicular to the run.

l. Cable trenches shall be blocked at the ends if required with brick masonry in cement sand mortar 1:6 and plaster with 15mm thick 1:4 cement sand mortar.

m. Cable trench contains cable trey that shall be supported on ISA. The size and spacing of angle section shall be as per design criteria mentioned above.

n. Cable trench shall be constructed as per enclosed tender drawing.

10.00 Foundation /RCC Construction

1. Work covered under this Clause of the Specification comprises the design and construction of foundations and other RCC constructions for switchyard structures, equipment supports, trenches, drains, control cubicles, bus supports, transformer, marshalling kiosks, auxiliary equipment & systems, buildings, tanks, boundary wall or for any other equipment or service and any other foundation required to complete the work. This clause is as well applicable to the other RCC constructions.

However, for the augmentation/bay extension works of existing substation, type of RCC structures and foundations etc. shall be similar to one already existing at the existing substation and for which design shall be furnished in support of safety of those RCC structures and foundations etc. Contractor must access the amount of work involved for the construction of switchyard structures, equipment supports, trenches, drains, control cubicles, bus supports, transformer, marshalling kiosks, auxiliary equipment & systems, buildings, tanks, boundary wall or for any other equipment or service and any other foundation required to complete the work for the existing substations.

2. Concrete shall conform to the requirements mentioned in IS: 456 and all the tests shall be conducted as per relevant Indian Standard Codes as mentioned in Standard field quality plan appended with the specification

A minimum grade for PCC and RCC shall be used for all structural/load-bearing members as per latest IS 456.

3. If the site is sloppy, the foundation height will be adjusted to maintain the exact level of the top of structures to compensate such slopes.

4. The switchyard foundation's plinths and building plinths shall be minimum 300mm and 500 mm above finished ground level respectively.

5. Minimum 75mm thick lean concrete shall be provided below all underground structures, foundations, trenches etc. to provide a base for construction.

6. Concrete made with Portland slag cement shall be carefully cured and special importance shall be given during the placing of concrete and removal of shuttering.

7. The design and detailing of foundations shall be done based on the approved soil data and sub-soil conditions as well as for all possible critical loads and the combinations thereof. The Spread footings foundation or pile foundation as may be required based on soil/sub-soil conditions and superimposed loads shall be provided.

8. If pile foundations are adopted, the same shall be cast-in-situ driven/bored or precast or under reamed type as per relevant parts of IS Code 2911. Only RCC piles shall be provided. Suitability of the adopted pile foundations shall be justified by way of full design calculations. Detailed design calculations shall be submitted by the bidder showing complete details of piles/pile groups proposed to be used. Necessary initial load test shall also be carried out by the bidder at their cost to establish the piles design capacity. Only after the design capacity of piles has been established, the Contractor shall take up the job of piling. Routine tests for the piles shall also be conducted. All the work (design & testing) shall be planned in such a way that these shall not cause any delay in project completion.

a. Design

1. Foundations shall be of reinforced cement concrete for new substation but for the augmentation / bay extension works of existing substation it could be of RCC/ PCC depending on type of structures and materials used for the similar type of structures in those bay extension works of existing substation. Design requirement shall be fulfilled by the Contractor and furnished for approval for both new substation and existing substation (for bay extension works) as specified in the scope of work. The design and construction of RCC/ PCC / Masonry structures shall be carried out as per IS: 456 and relevant IS code/CBIP manual/NBC etc and minimum grade of concrete shall be as per relevant IS code. Higher grade of concrete than specified above may be used at the discretion of Contractor without any additional financial implication to the Project Manager.

2. Limit state method of design shall be adopted unless specified otherwise in the specification.

3. For detailing of reinforcement IS: 2502 and SP: 34 shall be followed. Cold twisted deformed bars (Fe=415 N/mm2) conforming to IS: 1786 shall be used as reinforcement. However, in specific areas, mild steel (Grade I) conforming to IS: 432 can also be used. Two layers of reinforcement (on inner and outer face) shall be provided for wall & slab sections having thickness more than 150 mm. Clear cover to reinforcement towards the earth face shall be minimum 40 mm.

4. RCC water retaining structures like storage tanks, etc. shall be designed as un-cracked section in accordance with IS: 3370 (Part I to IV) by working stress method. However, water channels shall be designed as cracked section with limited steel stresses as per IS: 3370 (Part I to IV) by working stress method.

5. The procedure used for the design of the foundations shall be the most critical loading combination of the steel structure and or equipment and/or superstructure and other conditions, which produces the maximum stresses in the foundation or the foundation component and as per the relevant IS Codes of foundation design. Detailed design calculations shall be submitted by the bidder showing complete details of piles/pile groups or isolated /combined footings proposed to be used.

6. Design shall consider any sub-soil water pressure that may be encountered following relevant standard strictly.

7. Necessary protection to the foundation work, if required shall be provided to take care of any special requirements for aggressive alkaline soil, black cotton soil or any other type of soil which is detrimental/harmful to the concrete/masonry foundations.

8. RCC columns /pedestals shall be provided with rigid connection at the base.

9. All sub-structures shall be checked for sliding and overturning stability during both construction and operating conditions for various combinations of loads. Factors of safety for these cases shall be taken as mentioned in relevant IS Codes or as stipulated elsewhere in the Specifications. For checking against overturning, weight of soil vertically above footing shall be taken and inverted frustum of pyramid of earth on the foundation should not be considered.

10. Earth pressure for all underground structures shall be calculated using co-efficient of earth pressure at rest, co-efficient of active or passive earth pressure (whichever is applicable).

11. In addition to earth pressure and ground water pressure etc., a surcharge load of 1T/Sq.m shall also be considered for the design of all underground structures including channels, sumps, tanks, trenches, substructure of any underground hollow enclosure etc., for the vehicular traffic in the vicinity of the structure.

12. Following conditions shall be considered for the design of water tank in pumps house, channels, sumps, trenches and other underground structures:

i. Full water pressure from inside and no earth pressure & ground water pressure & surcharge pressure from outside (application only to structures, which are liable to be filled up with water or any other liquid).

ii. Full earth pressure, surcharge pressure and ground water pressure from outside and no water pressure from inside.

iii. Design shall also be checked against buoyancy due to the ground water during construction and maintenance stages. Minimum factor of safety of 1.5 against buoyancy shall be ensured ignoring the superimposed loadings.

13. The foundations shall be proportioned so that the estimated total and differential movements of the foundations are not greater than the movements that the structure or equipment is designed to accommodate.

14. The foundations of transformer and circuit breaker shall be of block type foundation. Minimum reinforcement shall be governed by IS: 2974 and IS: 456.

15. The tower and equipment foundations shall be checked for a factor of safety of 2.0 for normal condition and 1.5 for short circuit condition against sliding, overturning and pullout.

b. Admixtures & additives

1. Only approved admixtures shall be used in the concrete for the Works. When more than one admixture is to be used, each admixture shall be batched in its own batch and added to the mixing water separately before discharging into the mixer. Admixtures shall be delivered in suitably labeled containers to enable identification.

2. Admixtures in concrete shall conform to IS: 9103. The water proofing cement additives shall conform to IS: 2645. Project Manager shall approve concrete Admixtures/ Additives.

3. The Contractor may propose and the Project Manager may approve the use of a water-reducing set-retarding admixture in some of the concrete. The use of such an admixture will not be approved to overcome problems associated with inadequate concrete plant capacity or improperly planned placing operations and shall only be approved as an aid to overcoming unusual circumstances and placing conditions.

4. The water-reducing set-retarding admixture shall be an approved brand of Ligno-sulphonate type admixture.

5. The waterproofing cement additives shall be used as required / advised by the Project Manager.

c. Gates and Boundary Wall

1. The Gate frame shall be made of medium duty MS pipe conforming to relevant IS with welded joints.

2. The gates shall be fabricated with welded joints to achieve rigid connections. The gate frames shall be painted with one coat of approved steel primmer and two coats of synthetic enamel paint.

3. Gates shall be fitted with approved quality iron hinges, latch and latch catch. Latch and latch catch shall be suitable for attachment and operation of pad lock from either side of gates. Hinges shall permit gates to swing through 180 degree back against fence. Gates shall be earthed by G I wire.

4. Gates shall be fitted with galvanized chain hook or gate hold back to hold gates open. Double gates shall be fitted with centre rest and drop bolt to secure gates in closed position.

5. Gates shall be installed in locations shown on drawings. Next to the main gate, a men gate (1.25 m wide, single leaf) shall also be provided.

6. Bottom of gates shall be set approximately 40mm above ground surface and necessary guiding mechanism shall be fitted.

7. The Contractor shall design and construct boundary wall around substation area as per requirements. The boundary wall shall be of height 1.80M and shall be made of RCC frame construction with RCC column and plinth beam arrangement and panels filled with one brick thick wall in cement sand mortar 1:6. The boundary wall shall be plastered on both external and internal faces with cement and sand plaster 1:4 of thickness 15 mm. An additional concertina I-shaped arm of MS/GI angle 50x50x6 with 2-rows (2 nos.) concertina wire A-4 IS: 278. Expansion joints shall be provided as per code requirements. MS grating shall be provided at required locations for drainage purposes. The boundary wall shall be painted with minimum two coats of color wash over a base coat of white wash with lime. The front portion of boundary wall shall however be with a RC jail and 12 mm square MS bar top above brick work and pebble dash plaster finish with colour pigment. The steel work shall be given two coats of synthetic enamel paint of approved make over one coat of primer. Boundary wall and gate shall be constructed as per enclosed *tender drawing*.

11.00 Buildings - General Requirements

The scope for new control room building includes the design, engineering and construction including anti-termite treatment, plinth protection, DPC of Building including sanitary, water supply, electrification, false ceiling etc. of control room building. The buildings shall be of RCC framed structure of concrete of M20 grade (Min.). Following design criteria shall be adopted for design purposes for new substation.

If any extension of the Control Room building is required in augmentation / bay extension works of existing substation then extension part shall be compatible to existing one structurally and architecturally but following design criteria shall be adopted for design purposes for R&M of existing substation.

a. Control room Building

Minimum floor area requirements shall be 10000×12000 mm excluding space for wash room which may be increased at the time of detailed engineering to suit project requirements. The layout of the control room shall be finalized as per detailed engineering to suit project requirements .The minimum dimension of different rooms required for C.R. building shall be as per drawing. The CR building shall consist of the following:

a. Control room
b. S/s In-charge room
c. Battery room
d. Store room
e. Toilet

An open space of 1 m minimum shall be provided on the periphery of the rows of panel and equipment generally in order to allow easy operator movement and access as well as maintenance.

Any future possibility of annexed building shall be taken care of while finalizing the layout of the control room building.

Minimum headroom of 3 M below soffit of beams/false ceiling shall be considered for rooms. The roof shall have one side sloping roof or flat roof as finalized during detailed engineering.

i.Design

a) The buildings shall be designed:

1. To the requirements of the National Building Code of India, and the standards quoted therein.

2. For the specified climatic & loading conditions.

3. To adequately suit the requirements of the equipment and apparatus contained in the buildings and in all respects to be compatible with the intended use and occupancy.

4. With a functional and economical space arrangement.

5. For a life expectancy of structure, systems and components not less than that of the equipment, which is contained in the building, provided regular maintenance is carried out.

6. Be aesthetically pleasing. Different buildings shall show a uniformity and consistency in architectural design.

7. To allow for easy access to equipment and maintenance of the equipment.

8. With, wherever required, fire retarding materials for walls, ceilings and doors, which would prevent supporting or spreading of fire.

9. Suitable expansion joints shall be provided in the longitudinal direction wherever necessary with provision of twin columns.

10. Individual members of the buildings frame shall be designed for the worst combination of forces such as bending moment, axial force, shear force, torsion etc.

11. Permissible stresses for different load combinations shall be taken as per relevant IS Codes.

12. The building lighting shall be designed in accordance with the requirements of relevant section.

13. Seismic considerations as applicable.

ii.Design loads

Building structures shall be designed for the most critical combinations of dead loads, super-imposed loads, equipment loads, wind loads, seismic loads, and temperature loads.

Dead loads shall include the weight of structures complete with finishes, fixtures and partitions and should be taken as per IS: 1911.

Super-imposed loads in different areas shall include live loads, minor equipment loads, cable trays, small pipe racks/hangers and erection, operation and maintenance loads. Equipment loads shall constitute, if applicable, all load of equipments to be supported on the building frame.

The wind loads shall be computed as per IS 875, Seismic Coefficient method shall be used for the seismic analysis as per IS 1893 with importance factor 1.5.

Wind and Seismic forces shall not be considered to act simultaneously.

Floors/slabs shall be designed to carry loads imposed by equipment, cables piping, equipment and other loads associated with building. Floors shall be designed for live loads as per relevant IS. Cable and piping loads shall also be considered additionally for floors where these loads are expected.

For consideration of loads on structures, IS: 875 shall strictly adhere to. Any other load coming in the structure, not mentioned in IS 875 shall be calculated as per relevant IS code and NBC.

iii. Submission

The following information shall be submitted for review and approval to the Project Manager:

1. Design criteria shall comprise the codes and standards used, applicable climatic data including wind loads, earthquake factors maximum and minimum temperatures applicable to the building locations, assumptions of dead and live loads, including equipment loads, impact factors, safety factors and other relevant information.

2. Structural design calculations and drawing (including construction/fabrication) for all reinforced concrete and structural steel structures.

3. Fully, dimensioned concept plan including floor plans, cross sections, longitudinal sections, elevations and perspective view of each building. These drawings shall be drawn at a scale not smaller than 1:75 and shall identify the major building components.

4. Fully dimensioned drawings showing details and sections drawn to scales of sufficient size to clearly show sizes and configuration of the building components and the relationship between them.

5. Product information of building components and materials, including walls partitions flooring ceiling, roofing, door and windows and building finishes.

6. A detailed schedule of building finishes including colour schemes.

7. A door & window schedule showing door types and locations, door lock sets and latch sets and other door hardware.

Approval of the above information shall be obtained before ordering materials or starting fabrication or construction as applicable.

iv. Finish Schedule

1. The finishing schedule is given in subsequent clauses.

2. M.S. Ladder should be provided to access the control room roof from outside. Ladder shall be made up of ISMC 75x40 which will run as beam one meter apart and intermediate steps will be made up of 45x45x5 angle with rise of 300 mm. Red oxide premier shall be applied initially, then two coats of rich zinc paint shall be applied to avoid corrosion.

v.Flooring

Flooring in various rooms of control room building shall be as for detailed schedules given in Table -1

vi.Walls

Control room buildings shall be of framed superstructure. All walls shall be non-load bearing walls. Min. thickness of external walls shall be 250 mm (one brick) with 1:6 cement sand mortar.

vii.Plastering

All internal walls shall have minimum 15 mm thick 1:4 cement sand plaster on either side of wall. The ceiling shall have 10 mm thick 1:4 cement sand plaster.

viii.Finishing

All external surfaces shall have 20 mm thick 1:4 cement sand plaster with water proofing compound. The paint shall be antifungal quality of reputed brand suitable for masonry surfaces for high rainfall zone. White cement primer shall be used as per manufacturer's recommendation.

Internal finish Schedule is given Table - 1 below:

TABLE-1

S.No.	Location	Flooring & Skirting 150mm high	Wall Internal& Ceiling	Doors, Windows, Ventilators
1.	Control Room, Relay Room, Sub-station Incharge, Office, corridor, staff room.	10 to 20 mm designer paving tiles with alkali proof, acid proof tiles with top surface smooth.(Such as -Johnson Endura tiles) or specified in the drawing.	One coat solvent based primer with 02 coats acrylic emulsion paint over 2 to 4 mm thick putty or specified in the drawing.	1) Standard steel rolled section frames with 4 mm glass. or 34mm depth series aluminium window as specified in the drawing (min. thickness of aluminium member not less than 1.50mm), 4mm clear glass for aluminium Window & 5mm clear glass for aluminium door. 2) Flush door shutters
3.	Battery room	Acid and Alkali Resistant tiles.	Dado of acid resistant tile 1.2 M high & Paint of remaining portion-One coat solvent based primer with 02 coats acrylic emulsion paint over 2 to 4 mm thick putty or specified in the drawing.	
4.	Toilet	Ceramic glazed tiles in flooring	DADO glazed tile 2.1M high for toilet or One coat solvent based primer with	

			02 coats acrylic emulsion paint over 2 to 4 mm thick putty or specified in the drawing.	
5.	Other areas not specified	Terrazo tiles		

Note: DSR item references (DSR-2017) to be read with WBPWDSOR with latest corrigenda & Addenda&specifications are only for material and workmanship guidance of the Contractors.

ix.Roof

Roof of the C.R. Building shall consist of Cast-in-situ RCC slab treated with a water proofing system which shall be an integral cement based treatment conforming to WBPWD specification. The water proofing treatment shall be of following operations:

i.Applying and grouting a slurry coat of neat cement using 2.75 kg/m^2 of cement admixed with proprietary water proofing compounds conforming to IS: 2645 over the RCC slab including cleaning the surface before treatment.

ii.Laying cement concrete using broken bricks/brick bats 25mm to 100mm size with 50% of cement mortar 1:5 (1 cement: 5 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 over 20mm thick layer of cement mortar of min 1:5 (Cement: 5 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 to required slope and treating similarly the adjoining walls upto 300mm height including rounding of junctions of walls and slabs.

iii.After two days of proper curing applying a second coat of cement slurry admixed with proprietary water proofing compound conforming to IS: 2645.

iv.Finishing the surface with 20mm thick joint less cement mortar of mix 1:4 (1 cement: 4 course sand) admixed with proprietary water proofing compound conforming to IS: 2645 and finally finishing the surface with trowel with neat cement slurry and making of 300 x 300 mm square.

v.The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Project Manager.

With average thickness of 120 mm and minimum thickness at khurra at 65 mm.

x.Glazing

Minimum thickness of glazing shall be 5.0 mm. as per IS: 2835.

xi.Doors and Windows

The details of doors and windows of the control room building shall be as per finish schedule Table-1 and tender drawing with the relevant IS code. Rolling steel shutters and rolling steel grills

shall be provided as per layout and requirement of buildings. Paints used in the work shall be of best quality specified in WBPWD specification.

xii.Plumbing & Sanitation

1. All plumbing and sanitation shall be executed to comply with the requirements of the appropriate byelaws, rules and regulations of the Local Authority having jurisdiction over such matters. The Contractor shall arrange for all necessary formalities to be met in regard to inspection, testing, obtaining approval and giving notices etc.

2. PVC syntax or equivalent make Roof water tank of adequate capacity depending on the number of users for 24 hours storage shall be provided. Minimum 1 Nos. 500 liters capacity shall be provided.

3. Galvanized MS pipe of medium class conforming to IS: 1239 shall be used for internal & external piping work for potable water supply.

4. Sand CI pipes with lead joints conforming to IS: 1729 shall be used for sanitary works above ground level.

5. Each toilet shall have the following minimum fittings.

(a) WC (Western type) 390 mm high with toilet paper roll holder and all fittings

Or

WC (Indian Type) Orissa Pattern (580 x 440 mm) with all fittings (both types of WCs shall be provided at alternate locations).

(b) Urinal (430 x 260 x 350 mm size) with all fittings.

(c) Wash basin (550 x 400 mm) with all fittings.

(d) Bathroom mirror (600 x 450 x 6 mm thick) hard board backing

(e) CP brass towel rail (600 x 20 mm) with C.P. brass brackets

(f) Soap holder and liquid soap dispenser.

6. All fittings, fastener, grating shall be chromium plated.

7. All sanitary fixtures and fittings shall be of approved quality and type manufactured by well known manufacturers. All items brought to site must bear identification marks of the type of the Manufacturer.

8. Soil, waste and drain pipes, for underground works shall be stoneware for areas not subject to traffic load. Heavy-duty cast iron pipes shall be used otherwise.

9. In case of Augmentation/R&M of existing substation, amount of work shall be envisaged by contract for lump sum quotation.

12.00 Miscellaneous General Requirements

1. Dense concrete with controlled water cement ratio as per IS-code shall be used for all underground concrete structures such as pump-house, tanks, water retaining structures, cable and pipe trenches etc. for achieving water-tightness.

2. All joints including construction and expansion joints for the water retaining structures shall be made water tight by using PVC ribbed water stops with central bulb. However, kicker type (externally placed) PVC water stops shall be used for the base slab and in other areas where it is required to facilitate concreting. The minimum thickness of PVC water stops shall be 5 mm and minimum width shall be 230 mm.

3. All steel sections and fabricated structures that are required to be transported on sea shall be provided with anti corrosive paint to take care of sea worthiness.

4. All mild steel parts used in the water retaining structures shall be hot-double dip galvanised. The minimum coating of the zinc shall be 750 gm/sq. m. for galvanised structures and shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633.The galvanizing shall be followed by the application of an etching primer and dipping in black bitumen in accordance with BS: 3416.

5. A screed concrete layer not less than 100 mm thick and of grade not weaker than M10 conforming to IS: 456-1978 shall be provided below all water retaining structures. A sliding layer of bitumen paper or craft paper shall be provided over the screed layer to destroy the bond between the screed and the base slab concrete of the water retaining structures.

6. Bricks having minimum 75kg/cm2 compressive strength can only be used for masonry work. Contractor shall ascertain himself at site regarding the availability of bricks of minimum 75kg/cm2 compressive strength before submitting his offer.

7. Doors and windows on external walls of the buildings (other than areas provided, with insulated metal claddings) shall be provided with RCC sunshade over the openings with 300 mm projection on either side of the openings. Projection of sunshade from the wall shall be minimum 450 mm over window openings and 750 mm over door openings.

8. Service ladder shall be provided for access to all roofs.

9. Angles 45x45x5 mm (minimum) with lugs shall be provided for edge protection all round cut outs/openings in floor slab, edges of drains supporting grating covers, edges of RCC cable/pipe trenches supporting covers, edges of manholes supporting covers, supporting edges of manhole precast cover and any other place where breakage of corners of concrete is expected.

10. Anti termite chemical treatment shall be given to column pits, wall trenches, foundations of buildings, filling below the floors etc. as per IS: 6313 and other relevant Indian Standards.

11. All rungs for ladder shall also be galvanised as per IS: 277 medium classes.

12. For all civil works covered under this specification, nominal mix by volume batching as per WBPWD specification is intended. The relationship of grade of concrete and ratio of ingredients shall be as below:

Sl.No.	Mix	Cement	Sand	Coarse aggregate of 20 mm down grade as per IS 383
1.	M 10	1	3	6
2.	M 15	1	2	4
3.	M 20	1	1.5	3

The material specification, workmanship and acceptance criteria shall be as per relevant clauses of WBPWD specification and approved standard Field Quality Plan.

13. The details given in tender drawings shall be considered along with details available in this section of the specification while deciding various components of the building.

14. Items/components of buildings not explicitly covered in the specification but required for completion of the project shall be deemed to be included in the scope.

13.00 Interfacing

The proper coordination & execution of all interfacing civil works activities like fixing of conduits in roofs/walls/floors, fixing of foundation bolts, fixing of lighting fixtures, fixing of supports/embedment, provision of cutouts etc. shall be the sole responsibility of the Contractor. He shall plan all such activities in advance and execute in such a manner that interfacing activities do not become bottlenecks and dismantling, breakage etc. is reduced to minimum.

14.00 Water Supply

(i) Contractor shall make its own arrangement for construction water.

(ii) The Contractor shall carry out all the plumbing/erection works required for supply of water in control room building.

(iii) The details of tanks, pipes, fittings, fixtures etc for water supply are given elsewhere in the specification under respective sections.

(iv) A scheme shall be prepared by the Contractor indicating the layout and details of water supply which shall be got approved by the Project Manager before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works.

(v) Bore wells and pumps for water supply are in the scope of Contractor meeting the day-to-day requirement of the water supply.

(vi) If the water is supplied by Municipal Corporation then bore well for water supply purposes is not required to be carried out by Contractor. Contractor shall also make necessary arrangement /formalities to receive water connection from corporation.

15.00 Sewerage System

(i) Sewerage system shall be provided for control room building.

(ii) The Contractor shall construct septic tank and soak pit suitable for 5 users if outside of Municipal Corporation zone. Otherwise, all necessary arrangement for the disposal of sewerage to the Municipal Corporation's end shall be arranged by the Contractor at his own cost for regularizing the disposal activity.

(iii) The septic tank and soak pit shall be constructed as per enclosed tender drawing.

16.00 Statutory Rules

a. Contractor shall comply with all the applicable statutory rules pertaining to factories act (as applicable for the State). Fire Safety Rules of Tariff Advisory Committee, Water Act for pollution control etc.

b. Provisions for fire proof doors, no. of staircases, fire separation wall, plastering on structural members (in fire prone areas) etc. shall be made according to the recommendations of Tariff Advisory Committee.

c. Statutory clearance and norms of State Pollution Control Board shall be followed as per Water Act for effluent quality from plant.

d. Requirement of sulphate resistant cement (SRC) for sub structural works shall be decided in accordance with the Indian Standards based on the findings of the detailed soil investigation to be carried out by the Bidder.

e. Foundation system adopted by Bidder shall ensure that relative settlement and other criteria shall be as per provision in IS: 1904 and other Indian Standards

f. All water retaining structures designed as un-cracked section shall also be tested for water tightness at full water level in accordance with clause no. 10 of IS: 3370 (Part-I).

g. Construction joints shall be as per IS: 456.

h. All underground concrete structures like water retaining structures etc. shall have plasticizer cum water proofing cement additive conforming to IS: 9103. In addition, limit on permeability as given in IS: 2645 shall also be met with. The concrete surface of these structures in contact with earth shall also be provided with two coat of bituminous painting for water/damp proofing. In case of water leakage in the above structures, Injection Method shall be applied for repairing the leakage.

i. All building/construction materials shall conform to the best quality specified in WBPWD specifications if not otherwise mentioned in this specification.

j. All tests as required in the standard field quality plans have to be carried out.

17.00 Fencing

a. Product materials for fencing

The minimum requirements are as follows:

i.Chain Link fence fabric in accordance to IS-2721

1. Size of mesh : 75 mm
2. Nominal wire size : 4.0 mm dia
3. Width of chain link : 2000 mm
4. Class of zinc coating : medium
5. Zinc coated after weaving.

ii.Posts

Angle Section

Intermediate : L 65 x 65 x 6

Straining posts : L 65 x 65 x 6

Stay post : L 65 x 65 x 6

1. All structural steel shall conform to IS: 2062 and shall be painted with a coat of approved steel primer and two coats of synthetic enamel paint.

2. The Chain Link fabric shall be fixed to the post at the top and bottom of the fence by welding/fixing 50 mm MS flat all through its length.

3. Fencing top shall be either of galvanised barbed wire or tape. Barbed wire shall conform to IS: 278.

4. The barbed wire may consist of not more than two splices per reel. The barbed wire shall be formed by twisting two line wires, one containing the barbs. The barbed wire shall be designated as A-4 IS: 278 and shall be galvanized.

5. Above chain link, 3-rows (6 nos) of barbed tape/wire shall be provided in each arm of the Y shaped barbed arm at top.

6. With barbed tape/wire above the chain link fence, the total fence height shall be minimum 2500 mm above finished gravel level.

7. Barbed tape/wire arms shall be same as intermediate and straining post.

8. Tension wire: single strand, high tensile, galvanised steel wire, 4 mm diameter.

9. Fittings and hardware: cast aluminum alloy or galvanized steel, malleable or ductile cast iron turnbuckles to be drop forged.

10. GI chain link mesh shall be as per IS: 2721. Mesh size 75 mm and nominal wire size shall be 4.0 mm diameter.

On the results of these additional tests, the whole or portion of the barbed wire/tape shall be accepted or discarded by the Purchaser, as the case may be.

b. Installation

1. Contractor shall submit the fencing drawing Fence shall be installed along lines shown on approved drawings.

2. Post holes shall be excavated by approved methods.

3. Intermediate posts shall be spaced 2.5 m apart measured parallel to ground surface.

4. Straining posts shall be installed at equal intervals not exceeding 25.0 m.