

**TECHNICAL SPECIFICATIONS FOR ELECTRIFICATION WORK
AND MACHINERY ITEMS FOR SEWAGE TREATMENT
PLANT WITH CAPACITY 20 M³/DAY AT BILASPUR PSS.**

SCOPE OF WORK:

Supply, installation, testing and commissioning of the external electrification for Sewage Treatment Plant which shall comprise of the following:

Design, supply, installation, testing and commissioning of the Panel /Main Distribution board (MDB) and Sub-Distribution board (Single phase) as per the detailed specification and BOQ and drawing.

Supply and installation of the long lasting Switches, Power sockets, suitable size G.I. boxes as detailed out in the BOQ and specification.

Lighting of the STP using suitable energy saving LED type lighting fixtures is included the scope of work as detailed out in the BOQ and specification.

Supply and installation of ISI approved PVC medium gauge recessed conduit and house guard FR type multi-strand wiring to interconnect the above as per BOQ and specifications.

Supply, installation, testing and commissioning of earthing station and laying of earthing conductor as per BOQ and specifications.

Supply and Laying of buried power cable from main distribution panel to STP and sewage pump through cable trench, making and refilling the trench of required depth.

Motors of suitable rating and protection shall be provided for all motor driven equipments. Variable frequency drive as required shall also be provided as per the enclosed specifications. All motors shall be energy efficient.

CODES AND STANDARDS:

The design, manufacture, installation, testing, commissioning and performance of equipment's and services provided under this specification shall comply with the latest edition of the standards.

CONDUITING WORK:

GENERAL:

All conduits shall be medium gauge rigid PVC conduits.

Conduits shall be delivered to the construction site in original packed bundles and each length of conduit shall bear the label of the Manufacturer.

Appropriate conduit accessories shall be used and PVC or M.S. pull boxes

shall be provided at convenient locations in case of long lengths of conduits (exceeding 6 meters) so that rewiring, if required, can be done easily in the future.

A minimum number of ready-made bends shall be used as far as possible; the conduits shall be bent using bending springs. The bends shall be smooth and without any cracking.

Jointing of conduits shall be done using couplers and PVC solvent cement recommended or manufactured by the conduit manufacturer. Conduits shall be terminated in junction boxes or switch/socket boxes with couplers and adaptors.

Conduit assemblies without wiring shall be provided with G.I. pull wires of minimum 14 gauges.

All conduits shall be installed so as to avoid steam and hot water pipes.

After the conduits, junction boxes, outlet boxes, and switch boxes are installed, their outlets shall be properly plugged so that water, mortar, insects or other foreign matter does not enter into the conduit system.

3.2. CONCEALED CONDUITING:

Conduits concealed in slabs/columns shall be secured firmly by means of steel wires twisted and tied to the reinforcement bars prior to concreting. All precautions shall be taken to ensure no entry of cement slurry or blocking of conduits during concreting. Electrical Contractor's Supervisor / Electrician should be present at the time of pouring concrete and he should ensure that the conduit assemblies are not damaged.

Chases in the wall shall be neatly made and of ample dimensions to permit the conduit to be fixed in the manner desired. Chases should be left in the walls at the time of construction, if possible, and should be filled up neatly after erection of conduit and brought to the original finish of the wall.

WIRING:

WIRE TYPES & SIZES:

Wiring shall be carried out with FR type 1100V grade house guard approved make, PVC insulated multistrand flexible copper conductor cable conforming to IS-694 (1990) of different sizes mentioned in the BOQ.

COLOUR CODE:

A uniform color code shall be maintained for the entire wiring installation as follows:

Red, Yellow & Blue for the respective Phases, Black for Neutral and Green for earthing.

EARTHING WIRES:

Green PVC Copper Insulated earthing wires as mentioned in the BOQ shall be used for power socket outlets, switchboards, ceiling fan, exhaust fan and other electrical fixtures as mentioned in BOQ.

NUMBER OF WIRES IN CONDUITS:

The maximum number of stranded copper conductor, 1100V grade PVC insulated wires that may be drawn in conduits of various sizes given below

Wire Size In sq. mm.	: Maximum number of wires in conduits of size.					
	20 mm	25 mm	32 mm	38 mm	40 mm	
1.5	7	10	14	-	-	
2.5	5	8	12	-	-	
4.0	3	6	10	-	-	
6.0	2	4	8	10	-	
10.0	-	3	5	8	-	
16.0	-	-	3	5	8	

Wiring from two different phases i.e. R & Y, Y & B etc. shall not be bunched together in one conduit for single-phase circuits.

MDB to ISOLATOR - 2x6 Sqmm + 1x4 Sq mm - 25mm Conduit.

ISOLATOR to SDB - 2x6 Sqmm + 1x4 Sq mm - 25mm Conduit.

SDB to Switch board = 2x 2.5Sqmm + 1x 1.5 Sqmm - 20mm Conduit

SDB to Power Points = 2x 4Sqmm + 1x 2.5 Sqmm - 20mm Conduit

Maximum 3 circuits per conduit are permitted.

BUNCHING OF WIRES:

Current carrying wires shall be bunched that the outgoing & return wires are drawn into the same conduit. Wires originating from two different phases shall not run in the same conduit.

JOINTING OF WIRES:

All joints shall be made at switches, socket outlets & lighting fixtures only. No joints shall be allowed in conduits & junction boxes.

Insulation shall be shaved off like sharpening a pencil and it shall not be removed by cutting it square. Wire ends shall be soldered to at least 20mm length.

Strands of wires shall not be cut for connecting terminals. The terminals shall

have sufficient cross-sectional area to take all strands. Connecting brass screws shall have flat ends. The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less. All looped joints shall be connected through terminal blocks/connectors.

Conductors having nominal cross-sectional area exceeding 10.0sqmm shall always be provided with cable sockets. At all bolted terminals, brass flat washer of large area and approved steel spring shall be used. Brass nuts and bolts shall be used for all connections.

Only certified wiremen and cable jointers shall be employed to do jointing work.

SWITCHES AND SOCKETS:

All switches, sockets and other accessories shall be of approved PIANO range of **Vinay - Carol (or) Anchor (or) equivalent** Make.

All switches shall be placed in the line conductor of the circuit and no single pole switch or fuse shall be inserted in the earth or earthed neutral conductor of the circuit.

The location of switches and sockets shall be as fixed as per site condition and to be executed with the approval of Engineer-in-charge.

- 5.4 Ceiling rose to be provided wherever required as per the internal civil layout constructing, site condition, direction of Engg-in-charge for ceiling Fan Point, Exhaust fan point, Light fittings, Pendant light points, Staircase light points, Outdoor weather proof street light fixtures, Call bell point

SUB - DISTRIBUTION BOARD / MAIN METER PANEL (MDB):

RCCB / MCB Sub-Distribution boards shall be fabricated from 14 SWG (2mm thick) MS / CRCA sheets. The MS / CRCA sheets shall be duly rust inhibited through a process of degreasing, acid pickling, phosphating, and spray-painting to an approved colour over a coat of red oxide primer. The DB shall be provided with a hinged lockable double door arrangement as per BOQ and of approved make & as per IS: 8623 suitable for recessed mounting on wall / suitable for surface mounting with proper mounting angle non rusted frame. Phase boards shall have phase barriers of non-hygroscopic materials. Conduit knockouts shall be provided as required and the entire boards shall be rendered dust and vermin proof with necessary sealing gaskets. The distribution board shall be provided with required mounting arrangement suitable for accommodating RCCB/MCB and others as indicated in the BOQ. A circuit diagram indicating the board distribution shall be pasted on the inside of the DB and the nameplate details shall be stenciled on the DB as instructed.

Main Distribution boards shall be fabricated from 14 SWG (2mm thick) MS / CRCA sheets. The MS / CRCA sheets shall be duly rust inhibited through

a process of degreasing, acid pickling, phosphating, and spray- painting to an approved colour over a coat of red oxide primer. The MDB shall be fabricated in an approved manner to accommodate with incomer and outgoing as specified in the BOQ and suitable for surface mounting with proper mounting angle of non-rusted frame. Phase boards shall have phase barriers of non-hygroscopic materials. Conduit knockouts shall be provided as required and the entire boards shall be rendered dust and vermin proof with necessary sealing gaskets. The Main distribution board shall be provided with required mounting arrangement suitable for accommodating all the items as indicated in the BOQ. A circuit diagram indicating the board distribution shall be pasted on the inside of the MDB and the nameplate details shall be stenciled on the MDB as instructed. The MDB shall be complete with busbar arrangement of required capacity, internal wiring of required sizes, Cable lugs, ferrules, danger notice plate, pad locking arrangement etc.

BUSBARS:

Busbars shall be electrolytic tinned copper sized (or) suitable rating Aluminium busbars for a temperature rise of 35deg. C over the ambient, suitable for the incomer as per BOQ description and half rated current for neutral busbar and shall be extendable on either side.

Main horizontal busbars shall be of uniform cross-section. Vertical busbars for feeder columns may be rated at 75% of aggregate feeder capacity and shall be uniform in size.

Busbar and inteconnections shall be insulated with colour coded PVC sleeve/tape to prevent bar-to bar accidental shorts.

Busbars shall be supported on unbreakable, non-hygroscopic blocks at regular intervals so as to withstand the thermal and dynamic overloads during system short circuit. Connections between busbars and switches shall be through solid copper strips of proper size to carry full rated current and insulated with colour coded insulating tapes.

Boards shall meet with the requirements of IS: 2675 and marking the arrangements of busbars shall be in accordance with IS: 375. One earthing terminal for single phase and two terminals for three phase DB's shall be provided with an earth strip connecting the studs and the outgoing earth continuity earth bar.

Distribution boards shall be provided with components as described and rated in the BOQ.

MINIATURE CIRCUIT BREAKERS (MCB'S) / RESIDUAL CURRENT CIRCUIT BREAKERS (RCCB) :-

MCBs and RCCBs shall have quick make, quick break non-welding, self-wiping silver alloy contacts designed for a minimum of 10,000 operations and shall have a minimum breaking capacity of 10kA. The MCB's shall

comply to IS: 8828 and RCCB's shall comply to IS : 12640 - 1988 and also conforms to IEC 61009-1. Each pole of the breaker shall be provided with inverse time overload and instantaneous over current tripping elements with trip free mechanisms. In case of multiple MCB's the tripping must be all the poles and the operating handle shall be common. The frame size of MCBs / RCCBs of all the ratings shall be same so that they can be easily interchanged. Moreover a triple pole MCB could be substituted for any three adjacent single pole MCBs & vice-versa.

SWITCH FUSE UNITS & DISCONNECTS:

Switch fuse units shall have quick-make, quick-break, silver plated, and preferable double break contacts with operating mechanism suitable for rotary operation in case of cubicle mounting. All switches shall be rated as per equipment schedule or schematic diagram/ bill of quantities and shall withstand the system prospective fault current let through. Cam operated rotary switches with adequate terminal adaptors upto 25A are acceptable, but for all higher ratings, switch fuse units shall be heavy duty type conforming to IS: 4047.

Fuses shall be HRC cartridge type conforming to IS: 2208 with a breaking capacity corresponding to system fault level. Fuses shall be linked type with visible indication. Screw type diazed fuses are not acceptable for any ratings.

All disconnects shall consist of switch units quick-make, quick break type with silver plated contacts. The switches shall be preferably have double break. The switches shall preferably have sheet steel enclosure, which in turn, is mounted on suitable angle iron framework. In wet locations, disconnects shall have cast iron enclosures. Disconnects shall have a minimum breaking capacity of 5KA at 415V.

TESTING:

All panels / SDBs shall be megged phase to phase to neutral using 1000V meggar with all switchgear in the closed position. The meggar value should not be less than 2.5 megohms between phases and 1.5 megohms between phase and neutral.

7.00 GENERAL REQUIREMENTS

The wiring shall include providing and fixing all necessary item in the complete wiring of a piano switch circuit of length from the tapping point on the distribution circuit to the following via a switch. The wiring to be done from switchboard to the respective outlet point as per the electrical layout drawing, civil drawing and as directed by the Engineer In Charge: -

- a. Backplate (in case of stiff pendant, fluorescent fitting with down rod etc.)

- b. The exhaust fan body and ceiling fan body to be earthed using 1X1.5 sq mm Cu, PVC, green multistrand wire which will be run along with the phase wire in the recessed conduit from the respective switchboard. This will form part of exhaust fan & ceiling fan point wiring.

Circuit Wiring with 2X2.5sqmm + 1X1.5sqmm (Green) multi stranded copper conductor PVC insulated wires from Single phase SDB (RCCB/MCB) to switch box or switch box to Switch box for Lighting and 6A, 5 pin independent socket outlets as detailed out in the BOQ, electrical drawing, single line diagram and as per civil layout.

Circuit wiring with 2 X 4.0sqmm + 1x 2.5sqmm (Green) multistranded copper conductor PVC insulated wires from three phase SDB (RCCB /MCB) to Power Outlets (20A/25A).

Circuit wiring with 2 X 6.0sqmm + 1 x 4.0sqmm (Green) multistranded copper conductors PVC insulated wires from Meter panel / MDB (situated in basement parking / staircase area) to Single phase SDB (RCCB/MCB) (situated inside the individual residential Quarter) and through Master Entrance Isolator situated at the entrance of the individual quarter.

For the internal lighting recessed PVC conduit wiring system shall be provided. Conduit shall be medium guage type. Conduit pipe shall be fixed by means of staples/saddles not more than 600mm apart. Fixing of standard bends/elbows shall be avoided and all curves shall be maintained by bending the conduit itself with long radius, which will permit easy drawing in of the conductors.

Suitable Junction boxes/boxes shall be provided to permit periodical inspection and removal/replacement of wire if necessary.

Junction boxes and inspection boxes shall be mounted so that its cover will be flushed with the finished surface of the ceiling column.

The swich and regulator box and cover plates shall be as per item description of BOQ.

All the supporting and fixing accessories of lighting fittings shall be painted as required to prevent against corrosion and also to match with the colour of the fittings/ceiling etc.

The fittings shall be suspended/fixed/recessed systematically uniformly at the same level from ceiling/wall in the buildings.

Each circuit shall have independent neutral wire and shall be completed upto outlet box and switch box.

All the switches for light point, fan point and 6A socket point to be rated for 6A, 250V and for 16A, 6 pin socket, it shall be rated for 16A, 250V and for 25A, Power socket; it shall be rated for 25A.

All sockets shall be flush mounted types and 6A socket shall be 5-pin type with safety shutter, while 16/6A socket shall be with 6 pins. Third pin of all the sockets shall be earthed. The 16A socket shall be provided with indicator, fuse as per item description of BOQ and safety shutter.

6 Amps; 16/6 Amps & 25A -socket outlet shall be fixed at any convenient place at Normal switch level or near such level as desired by Engg-in- Charge.

SERVICE CONDITION:

The SDB/MDB Panel to be supplied against this specification shall be suitable for satisfactory continues operation under the following condition:

- | | | |
|----|--|---------------------|
| a) | Specified operating temperature range | 0 deg. to + 55 deg. |
| b) | Relative Humidity (%) | 10 to 90 |
| c) | Maximum annual rainfall (mm) | 1450 |
| d) | Maximum wind pressure (Kg/ m. sq)) | 150 |
| e) | Maximum altitude above mean sea level (meters) | 1000 |

The cover shall be made out of such material so as to give it tough and non- breakable qualities and shall be secured to base by means of sealable captive screws.

A moulded terminal block for current and voltage connections conforming to relevant standard to meet the requirement of terminal connection arrangement shall be provided and shall be housed in one chamber located at the bottom of the meter. The terminals arrangement shall be provided with a cover and shall be sealable independently to prevent unauthorized tampering.

All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, nonaging and of tested quality.

All parts in are likely to develop corrosion to working condition, shall be effectively protected against corrosion by suitable method to achieve durable results.

Sealing provision shall be made against opening of the terminal cover and front cover. The meter shall be pilfer-proof & tamper-proof.

The meters having poly carbonate base and cover shall be ultra-sonically welded so that once the meter is manufactured and tested at factory; it should not be possible to open the cover at site except the terminal cover. Similarly, the meters having metal base and cover shall be fixed mechanically such that it should not be possible to cover at site, so that once the meter is manufactured and tested at factory may not be opened except the terminal cover.

CONNECTION DIAGRAM AND TERMINAL MARKING:

The connection diagram of the panel shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Panel terminal shall also be marked and this marking should appear in the above diagram.

NAME PLATE AND MARKING:

The SDB/MDB shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standards. The manufactures of meter constant shall be marked on the name plate:

In addition to the requirement as per IS following shall be marked on the name plate:

- 1) Manufacturer's name and trade mark:
- 2) Sr. Number & year of manufacture:
- 3) Embossing the name of purchaser

9.00 MOTOR

The sewage pump shall be vertical non-clog, single stage, centrifugal, wear resisting type having total head of 9-22 mtrs & discharge of 1200-400 LPM. The pump shall have end suction & the discharge nozzle shall be oriented in angular horizontal direction to handle solids upto 30 mm & sewage with stingy material.

DESIGN PARAMETERS:

- a. The pump shall be capable of developing the required total head at the rated capacity.
- b. The total head capacity curve shall be continuously rising towards the shut off, with highest at the shut off
- c. The pump shall run smooth without undesirable noise and vibration
- d. The pump shall be suitable for starting with discharge valve open.
- e. The pump shall be capable of withstanding the accidental rotation in reverse direction.
- f. Shaft power of the pump must be less than the motor rating even when the pump operating at 80% of the rated head.
- g. The efficiency of the pump should be fairly uniformed for the range of 85% to 110% of the rated flow. & it should not be less than 83% at duty point.

FEATURES OF CONSTRUCTION OF PUMP:-

General description:

The sewage pump shall be single stage, end suction, vertical non clog sewage pump. The pump is installed on concrete platform in dry sump on sole plate. Motive power is provided by electric motor through intermediate shafts. Top intermediate shaft is coupled by rigid split muff coupling to the bottom intermediate shaft & the bottom intermediate shaft is coupled to the pump by pin bush type couplings of adequate capacity. Motor is mounted on Motor stool which is installed on sole plate at motor floor level.

Detailed description:-

The construction of the pump shall be relatively simple, allowing almost all maintenance jobs to be carried out without removing the pump from foundation.

Rotating elements:-

Rotating elements consists of a spindle on which a close type impeller shall be keyed at far end & positively located by lock screws against shaft sleeve. Impeller shall be protected on neck portion by renewable neck wear rings. Spindle shall be protected in stuffing box by renewable shaft sleeve. Shaft sleeve abuts against Impeller on one side & shaft

collar on other side. Shaft shall be supported on bearings in bearing housing.

Connections:-

The suction end discharge connections shall be flanged & drilled as per I.S. 1537 to match the existing delivery pipe line & suction pipe line; flanges shall be flat and shall have appropriate size tapping at the suction and discharge nozzles for pressure measurement. Two sets of Pressure gauges of approved make & suitable range along with all accessories shall be provided (cost inclusive). The bidder shall visit the site and get acquainted with exact flange details before submitting the bid.

Requirement of Pump Characteristics:-

- a. The pump characteristics shall be suitable for operating the pump in parallel with the existing pumps under any combination with respect to number of pumps in operation (maximum 5 no. of pumps)
- b. Tenderer shall verify the duty points (Head & Capacity) for the pump offered taking into account the station losses, pump losses, total lift
- c. The efficiency for the selected pump shall be guaranteed at main duty point

EARTHING:

Scope:

This Section covers the preparation of earth electrode by digging pit in the soil.

Reference Standards: IS-3043 - 1966 - Code of practice for Earthing

Earthing shall generally be carried out in accordance with the provision of above standard and the requirements of Indian Electricity Rules, 1956 as amended from time to time and the relevant regulations of the Electricity supply Authority concerned. The following Indian Electricity Rules are particularly applicable: 32, 51, 61, 62, 67, 69, 88 (2) & 90.

General Requirements:

- (i) All medium voltage equipment shall be earthed by two separate and distinct connections with earth through an earth electrode. In the case of high and extra high voltages the neutral points shall be earthed by not less than two

separate and distinct connections with earth each having its own electrode and may be earthed at any other point provided no interference is caused by such earthing. If necessary, the neutral may be earthed through suitable impedance.

- (ii) As far as possible all earth connections shall be visible for inspection.
- (iii) All connections shall be carefully made; if they are poorly made or inadequate for the purpose for which they are intended, loss of life or serious personal injury may result.
- (iv) Each earth system shall be so devised that the testing of individual earth electrode is possible. It is recommended that the value of any earth system resistance shall not be more than 5 Ohms unless otherwise specified.
- (v) It is recommended that a drawing showing the main earth connection and earth electrodes be prepared for each installation.
- (vi) All fittings etc. used in earthing shall conform to Indian Standard specifications wherever these exist.
- (vii) The Main Distribution board / Meter Panel shall be earthed with 2 nos. of 25mm * 6mm G.S. strips to the independent Earth electrode station as per drawing and as per direction of Engineer-in-charge.
- (viii) Main earthing conductors shall be taken from the earth connections at the main switch boards to earth electrode with which the connection is to be made.

Preparation of Earth Electrode:

- (i) Where there is any option, a site shall be chosen in one of the following types of soil in order of preference :-
 - a) Wet marshy ground and grounds containing refuse such as, ashes, cinders and brine waste.
 - b) Clayey soil or loam mixed with small quantities of sand
 - c) Clay and loam mixed with varying proportions of sand, gravel and stone
 - d) Damp and wet sand pit
- (ii) Electrodes shall preferably be situated in a soil which has a fine texture and which is packed by watering and ramming as tightly as possible. Where practically the soil shall be sifted and all lumps shall be broken up and stones removed in the immediate vicinity of the electrodes.
- (iii) Recourse may be to go for chemical treatment of soil to improve the conductivity. Common salt is generally used for this purpose and the addition of less than one part by weight of salt to 200 soil moisture has been found to reduce the resistivity by 80 percent but there is little advantage in increasing the salt content above 3 percent. Calcium chloride, sodium carbonate and other substances too have been found beneficial. But before chemical treatment is applied, it shall be verified that no deleterious effect on the electrode material will result.

- (iv) Use shall be made, where possible, of natural salts in soils produced by bacteriological action on decaying plants. The resistivity of soil on which plants are growing will be lower than that of the same soil in the absence of plants.
- (v) In places where the soil conditions appear to be extensively corrosive, the soil may be chemically examined before deciding the material of the earth electrode.

Earth Electrode material:

- (i) Although electrode material does not affect initial earth resistance, care shall be taken to select a material which is resistant to corrosion in the type of soil in which it will be used.
- (ii) Under ordinary conditions of soil, use of copper, iron or mild steel electrodes are recommended.
- (iii) In cases where soil conditions points to excessive corrosion of the electrode and the connections, it is recommended to use either copper electrode or copper clad electrode or zinc coated (galvanized) iron electrodes.
- (iv) The electrode shall be kept free from paint, enamel and grease.
- (v) It is recommended to use similar material for earth electrodes and earth conductors or otherwise precautions shall be taken to avoid corrosion.

EARTHING STATION:

- (a) **Plate Electrode Earthing:** Earthing electrode shall consist of a tinned copper plate not less than 600 mm x 600 mm x 3 mm. thick or 600 mm x 600 mm x 6 mm G.I. as called for in the drawing or as specified in Bill of Quantities. The plate electrode shall be buried as far as practicable below permanent moisture level but in any case not less than 3 meters below ground level.

Wherever possible earth electrodes shall be located as near the water tap, water drain or a down take pipe as possible. Earth electrodes shall not be installed in proximity to a metal fence. It shall be kept clear of the building foundation and in no case shall it be nearer than 2 meters from the outer

face of the wall. The location of the earthing station shall be as per the direction of Engineer-in-charge during the execution of work.

Care shall be taken to see that the excavation for earth electrode does not affect the foundation of the building; in such cases, electrodes may be located further away from the building with the prior approval of Engineer-in-charge. The location of the earth electrode will be such that the soil has a reasonable chance of remaining moist as far as possible. Entrances, pavements, and roadways, should be avoided for location earth electrodes.

The earth plate shall be set vertically and surrounded with 150 mm thick layer of charcoal dust and salt mixture. If the electrode cannot be laid in a straight length, it may be laid in a zigzag manner with a deviation upto 45 deg. From the axis of the strip. It can also be laid in the form of an arc with curvature more than 1 M or a polygon and as per IS:3045 (latest edition) and CPWD Electrical Specifications. 20 mm G.I. pipe shall run from the top of the pipe shall be provided with funnel and a mesh for watering the earth through the pipe. The funnel over the G.I. pipe shall be housed in masonry chambers approximately 300 mm x 300 mm x 300 mm deep. The masonry chamber shall be provided with a cast iron cover resting over a

D.I. frame embedded in masonry.

EARTH CONNECTION:

All metal clad switches and other equipment carrying single-phase current, shall be connected to earth by a single connection. All metal clad switches carrying medium voltage and high voltage shall be connected with earth by town separate and distinct connections. The earthing conductors inside the building wherever exposed shall be properly protected from mechanical injury by running the same in G.I. pipe of adequate size.

Earthing conductors outside the building shall be laid 600 mm below the finished ground level.

2 Nos. of 25 mm x 6 mm GI strip as per BOQ and as per direction of Engineer-in-charge shall be laid from the earthing station to the Main Incomer LT Meter Panel.

The over lapping in copper strips at joints where required shall be minimum 75 mm. The joints shall be riveted with copper rivets and brazed in approved manner. Sweated lugs of adequate capacity and size shall be used for all termination of wires above 6 sq. mm. size and bare copper wire above 2.5 mm dia. Lugs shall be bolted to be equipment body to be earthed after the metal body is cleaned of paint and other oily substance and properly tinned.

11.0. **GENERAL**

EQUIPMENT, MATERIAL & WORKMANSHIP

Good workmanship is an essential requirement for compliance with the contract and the work shall be carried out under the direct supervision of a person competent enough for the purpose.

It shall be the responsibility of the Contractor to determine that each piece of equipment meets the detailed requirements of the drawings & specifications and that it is suitable for the installation shown. The Engineer-in-charge shall be notified of any shortcomings found during the construction period. Equipment's not meeting all requirements will not be acceptable, even though specified by name along with other manufacturers.

Where two or more units of the same class of equipment are furnished, they shall be of the same manufacturer; component parts of entire systems need not be of the same manufacturer.

All materials & equipment shall be furnished new and free from defects and of the size, make, type & quality herein specified or approved by the site engg-in-charge. They shall be installed in a neat & workman like manner.

CUTTING, PATCHING & REPAIRING

Cutting, patching & repairing required for the proper installation & completion of the work including plastering, masonry work, concrete work, carpentry & painting shall be performed by skilled craftsmen in the respective trades. Holes, which are cut over size shall be filled so that a tight fit is obtained around the pipe or other object passing through.

All foreign matter caused by such operations to be removed from equipment & premises.

INSERTS & SLEEVES:

The work shall be laid out in advance of pouring of slabs or construction of walls/furnishings and inserts and sleeves shall be set as necessary to complete the work. The cost of cutting or patching necessary as result of this operation shall be at no extra expenses to the Owner.

EQUIPMENT PROTECTION

All cables & conduit openings shall be kept closed by means of plugs or caps to prevent entrance of foreign matter. All cables, conduits, raceways, fixtures & other equipment's shall be properly protected.

Any such item damaged prior to final acceptance of the work be restored to its original condition or replaced at no expenses to the Owner.

All equipment & materials stored on the site shall be completely covered or otherwise protected against vermin, dust & foreign materials.

10.5 REGULATIONS & STANDARDS:

The installation shall conform to the current Indian Electricity Rules & Regulations, the requirements of the Local Electric Supply Authority. Whenever the Tender Specification calls for a higher Standard of material and/or workmanship than those required by any of the above regulations, then Tender Specification takes precedence over the said Rules & Regulations.

11.6 MATERIALS & EQUIPMENTS:

All materials and equipments shall conform to the relevant standards and shall be of approved make and design. Unless otherwise called for, only the best quality of materials and equipments shall be used. A list of makes of materials and equipments that the Contractor proposes to use, together with samples shall be submitted to the Engineer-in-charge before commencement of work. Where no specific make is specified, any first class product of a reputed manufacturer may be used, with the approval of engg-in-charge.

TENDER DRAWINGS & SPECIFICATIONS:

The data given in the Drawings and Specifications is as exact as could be secured, but its complete accuracy is not guaranteed. The drawings indicate only the general scheme of requirements and are for the guidance of the Contractor. The exact positions of all points, control switch boxes, runs of wiring and/or conduits, main panels, distribution boards etc. will be governed by the building and the interior layout and should be approved by the Engineer-in-charge before commencement of works.

WORKMEN:

Only qualified and skilled wiremen shall be employed in the execution of work and the Contractor shall keep consultancy on site a properly qualified and experienced Supervisor

duly authorized and empowered to act for him and receive on his behalf any instructions given by the Consultants.

The Engineer-in-charge reserves the right to object to the retention of the appointed Supervisor or any of his skilled or unskilled staff at any stage during the period of continuation of the work.

REMOVAL OF IMPROPER WORK:

The Engineer-in-charge shall, during the progress of work, have the power to order the removal of any work, materials or equipments, which in their opinion are not as per specifications or instructions. The substitution of improper materials and/or the removal and re-execution of such works shall be carried out by the Contractor forthwith and at his own cost. Including material and Labour as per the Contract.

CO-ORDINATION WITH ORHER AGENCIES:

The Contractor shall offer all co-operations to other Contractors carrying out their specialized works. He shall co-ordinate his work with that of other agencies so as to complete the project without any hindrance.

13.00 TECHNICAL PARAMETERS:

Incandenscent Lamps	:	15W, 240V AC
Lamps	:	14W / 8W, CFL Retrofit, 240V AC
T5 lamps	:	28W , Flourescent lamp
Sockets	:	10A, 240V AC, 5 Pin Universal
Sockets	:	20A, 240V AC, 6 Pin
RCCB	:	40A/30mA, 4 Pole - 440V
MCB & MCB Isolator	:	10KA
Fluorescent Lamps	:	Energy saving slim tube rod, 36W, 240V AC

15.00. MAKES OF EQUIPMENTS (All should be IS approved)

TPN-SFU	-	Siemens, GE, L & T
S P Fuse	-	GE. L&T OR AS APPROVED BY POWERGRID
SP / DP MCB/ RCCBs	-	MDS (LEXIC), Merilyne Gerin, Havell's, L&T - Hager
T5 LIGHT FITTINGS	-	WIPRO, CROMPTON, PHILIPS, BAJAJ, ASIAN ELECTRONICS
T5 tube rod	-	BAJAJ, WIPRO OSRAM (or) equivalent make

Compact fluorescent lamp	-	Bajaj ; Wipro ; Philips ; Osram (Retrofit type)
Batton holder / Angle holder	-	ANCHOR, (or) eqvnt. Make Street light
weather proof fixture -		Wipro (or) Philips (or) Bajaj (or) Crompton make
EXHAUST FAN	-	CROMPTON, USHA, BAJAJ, Khaitan, Almonard
SEWAGE PUMP	-	CROMPTON, Mather & Platt, Kirloskar Brothers Ltd., Jyoti.
Medium Conduit & Accessories Wiring Accessories	-	ISI approved Precision, Diamond or equivalent make
Multistrand Copper Conductor		
PVC insulated Wires(FR type)	-	Finolex, Polycab,
Switches, Switch Socket, Power Socket (6A/16A), Ceiling Roses, Switch Box & Other items	-	ANCHOR, FINOLEX, (or) equivalent make
GI Pipes	-	ISI approved make
Static type Energy meter meter)	-	L&T / Enercon / Emco / Actaris - (Watt-hour Schlumberger/ L&G / Secure Meters

Technical Specifications- 1- SEWAGE TREATMENT PLANT WITH CAPACITY 20 M³/DAY for Machinery item

A.1 BAR SCREEN

MOC	MSEP
QTY	01 NO
DUTY	TO REMOVE FLOTING MATTER FROM INCOMING SEWAGE

A.2 RAW SEWAGE FEED PUMP

MOC	C.I.
MAKE	KBL/CROMPTON/WILO/ EQUVI
QTY	02 NOS (01W, 01 SB)
POWER	1.0 H.P./ 2900 RPM
TYPE	CENTRIFUGAL SELF PRIMING
MOUNTING	BASE FRAME
DUTY	TO PUMP RAW SEWAGE TO MBBR TANK

A.3 MOVING BED BIOREACTOR

MOC	MSEP
QTY	01 NOS
CAPACITY	1.0 M ³ /hr
MEDIA	PVC FILL MEDIA
DUTY	TO AREATE THE RAW SEWAGE

A.4 AIR BLOWER

MOC	C.I.
MAKE	EVEREST / AKASH/ USHA /TMVT/EQUVI
QTY	02 NOS (01 W, 01 SB)
TYPE	TWIN LOBE
POWER	2.0 H.P.
MOTOR	CROMPTON/KIRLOSKAR /EQUIVALENT
MOUNTING	M.S. FABRICATED
DUTY	TO PROVIDE AIR FOR AERATION AT DIFFERENT PLACES WITHIN STP

A.5 MBBR FILL MEDIA

MOC	PVC
MAKE	Cool Deck / Equivalent
QTY	01 LOT
AREA	400 M ² / M ³
DUTY	INCREASE THE CONTACT PERIOD OF AIR AND WATER

A.6 FINE BUBBLE DIFFUSARS

MOC	PVC /EPDM
MAKE	SOUTHERN COHEGEN or EQUIVALENT
QTY	01 LOT
TYPE	TUBLAR /DISC
DUTY	TO DELIVER THE AIR IN THE FORM OF FINE BUBBLS

A.7 SECONDARY TUBE SETTLER

MOC	MSEP
QTY	01 NOS
CAPACITY	0.625 M ³ /hr
MEDIA	TUBE DECK
DUTY	TO SETTLE THE SOLIDS FROM AERATED SEWAGE

A.8 TUBE DECK MEDIA FOR SECONDARY TUBE SETTLER

MOC	PVC
MAKE	COOL DECK / EQUIVALENT
QTY	01 LOT
TYPE	CHEVRON- UNEQUAL HEXAGONAL
AREA	11M ² / M ³
DUTY	ENHANCE THE SETTLING OF SLUDGE IN TUBE SETTLER

A.9 SLUDGE RECIRCULATION PUMP

MOC	C.I.
MAKE	KBL/CROMPTON/WILO/ EQUVI
QTY	01 NO (01W)
POWER	1 H.P/ 2900 RPM
TYPE	CENTRIFUGAL SELF PRIMING
MOUNTING	BASE FRAME
DUTY	RECIRCULATION OF SLUDGE TO MBBR

A.10 CLARIFIED WATER TANK

MOC	HDPE
QTY	01 NOS
CAPACITY	1500 LITS
DUTY	TO HOLD THE WATER BEFORE FEEDING TO PSF & ACF

A.11 FILTER FEED PUMP

MOC	C.I.
MAKE	KBL/CROMPTON/WILO/ EQUVI
QTY	02 NOS (01W, 01 SB)
POWER	1 H.P/ 2900 RPM
TYPE	CENTRIFUGAL
MOUNTING	BASE FRAME
DUTY	TO PUMP IN TO PRESSURE SAND FILTER

A.12 PRESSURE SAND FILTER

MOC	FRP
QTY	01 NOS
TYPE	CYLINDRICAL
PRESSURE	2.0 Kg/CM ²
MOUNTING	LEG/ SKIRT SUPPORT
PIPING & ACCESSORIES	PIPING AND MULTI PORT VALVE WITH DITRIBUTOR
FILTER MEDIA	FINE SAND
DUTY	TO FILTER THE CLARIFIED WATER

A.13 ACTIVATED CARBON FILTER

MOC	FRP
QTY	01 NOS
TYPE	CYLINDRICAL
PRESSURE	2.0 Kg/CM ²
MOUNTING	LEG/ SKIRT SUPPORT
PIPING & ACCESSORIES	FRONTAL PIPING AND MULTI VALVES WITH DITRIBUTOR AND AIR RELEASE ARRANGEMENT
FILTER MEDIA	ACTIVATED CARBON
DUTY	TO REMOVE COLOUR AND ODOR IF ANY FROM CLARIFIED WATER

A.14 PIPING & VALVES

MOC	M.S/UPVC / PVC
MAKE	DIFFERENT STANDERED MAKE
QTY	01LOT

A.15 ELECTRICAL PANEL AND CABLES

CONTACTOR MAKE	L & T , Havells , Siemens / Equivalent
MOC	M.S. POWDER QUOTED (PANEL)
QTY	01 NOS
TYPE	QUBICAL
CABLE	IN REQUIRED QTY
ACCESSORIES	CABLE TREY, GLANDS ETC. IN REQUIRED QTY

A.16 CHLORINE DOSING TANK WITH METERING PUMP

MOC	HDPE
QTY	01 NOS
CAPACITY	50 LITS
DUTY	CHLORINE DOSING
METERING PUMP	QTY:- 01 NO CAPACITY :- 04 LITS/HR

A.17 INSTRUMENTTATION

LEVEL SWITCHES	01 LOT
DUTY	AUTOMATIC OPERATION OF PLANT

A.18 *TESTING KIT*

PEN	TYPE	TDS METER	01	NO
PEN	TYPE	pH METER	01	NO