TECHNICAL SPECIFICATIONS (ELECTRICAL)
SPECIFICATION OF MATERIAL

All the material to be used shall be as per the specified make of the materials list and ISI approved Brand. Any deviation from this shall be got approved from Architect / Owner, the contractor shall submit samples of material to be used for verifications and Produce Bill in original.

1. SAMPLES

After receipt of the bids but prior to award of the contract, bidder shall, Upon notification from owner submit samples of materials he intends to Use.

The owner shall reserve the right to evaluate the sample with regard to the Specification before award of work. Samples as directed by the Architect / Owner for various items shall be prepared / brought for approval without Any cost.

Special Notes :

a) The successful tendered will have to supply the make of the materials as recommended and in consultation with the Client / Architect / Consultant without any extra cost. Client / Architect / Consultant reserve the rights to choose any make out of above list.

b) Tenderer should have to specify the list of makes considered in the tender while quoting the rates in the tender, in covering letter of separate letter enclosure. However, the final decision for accepting make specified by tenderer would be of client / Architect / Consultants.

c) As far as possible, the successful tenderer will have to place order directly to the manufacturer or it’s authorized dealer.

d) The client / Architect / Consultant have right to Check the Challans of supplier.

e) The RCCB, RCBO, MCB and MCB DBs must be of same make.

f) Make of components required to be used by contractor to complete the installation, if not mentioned anywhere, shall be required to GOT it Approved by Client / Architect / Consultant before installation in writing manner.

g) Within a week of work order, the contractor shall submit the sample of each item / component of above-mentioned approved make for the approval of the Client / Architect / Consultant.
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>IS No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>IS:2026-1977 IS 3639</td>
<td>Distributing transformers &amp; fittings. Fittings and acc. For P.T.</td>
</tr>
<tr>
<td>2)</td>
<td>IS:7886 IS:660</td>
<td>Installation of Transformer.</td>
</tr>
<tr>
<td>4)</td>
<td>IS:335</td>
<td>Insulating oil for Transformers &amp; switch gear.</td>
</tr>
<tr>
<td>5)</td>
<td>IS:2705</td>
<td>CT for measuring and protection.</td>
</tr>
<tr>
<td>6)</td>
<td>IS:3155</td>
<td>Voltage (Potential) Transformers.</td>
</tr>
<tr>
<td>7)</td>
<td>IS:3236 Part II</td>
<td>Voltage Transformer.</td>
</tr>
<tr>
<td>8)</td>
<td>IS:373</td>
<td>Busbar arrangement and marking.</td>
</tr>
<tr>
<td>9)</td>
<td>IS:2099</td>
<td>Bushing</td>
</tr>
<tr>
<td>10)</td>
<td>IS:5621</td>
<td>Large Hollow Porcelains</td>
</tr>
<tr>
<td>11)</td>
<td>IS:2544</td>
<td>Insulators</td>
</tr>
<tr>
<td>12)</td>
<td>IS:2629 &amp; 2633</td>
<td>Hot Dip Galvanizing</td>
</tr>
<tr>
<td>13)</td>
<td>IS:3842</td>
<td>Relays.</td>
</tr>
<tr>
<td>15)</td>
<td>IS:3072-1975</td>
<td>Installation of Switch gears.</td>
</tr>
<tr>
<td>16)</td>
<td>IS:692</td>
<td>HV cable.</td>
</tr>
<tr>
<td>17)</td>
<td>IS:1255</td>
<td>Installation of HV cables and jointing.</td>
</tr>
<tr>
<td>19)</td>
<td>IS:4047-1977</td>
<td>HD Air breaker, Switch gears and fuses for Voltage not exceeding 1000 Volts</td>
</tr>
<tr>
<td>20)</td>
<td>IS:8106-1966</td>
<td>Selection, installation and maintenance of fuses upto 650 Volts.</td>
</tr>
<tr>
<td>No.</td>
<td>IS Code</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
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<td>-------------</td>
</tr>
<tr>
<td>23)</td>
<td>IS:8623-1977</td>
<td>Factory built assemblies of switch gears and control gears for voltage upto and including 1000 Volts A.C. and 1200 Volts D.C.</td>
</tr>
<tr>
<td>24)</td>
<td>IS:375-1963</td>
<td>Marking and arrangement of switch gear bus bars main connectors and auxiliary wiring.</td>
</tr>
<tr>
<td>26)</td>
<td>IS:8084-1972</td>
<td>Insulated conductor rating.</td>
</tr>
<tr>
<td>29)</td>
<td>IS:9926-1981</td>
<td>Fuse wire used in re-wearable type electric fuses upto 650Volts.</td>
</tr>
<tr>
<td>30)</td>
<td>IS:1554 (Part I)</td>
<td>PVC insulated electric cables Heavy duty.</td>
</tr>
<tr>
<td>31)</td>
<td>IS:3961 (Part II)</td>
<td>Recommended current rating for cables.</td>
</tr>
<tr>
<td>32)</td>
<td>IS:2982</td>
<td>Copper conductor in insulated cables and cores.</td>
</tr>
<tr>
<td>33)</td>
<td>IS:8130</td>
<td>Conductor for insulated electric cables and flexible rods.</td>
</tr>
<tr>
<td>34)</td>
<td>IS:3975</td>
<td>Mild steel wires, strips and tapes for armouring cables.</td>
</tr>
<tr>
<td>35)</td>
<td>IS:5831</td>
<td>PVC insulation and sheath of electric cables.</td>
</tr>
<tr>
<td>36)</td>
<td>IS:1753</td>
<td>Aluminum conductor for insulated cables.</td>
</tr>
<tr>
<td>37)</td>
<td>IS:4288</td>
<td>PVC insulated and PVC sheathed solid aluminum conductor cables of voltage rating not exceeding 1100 volts.</td>
</tr>
</tbody>
</table>
38) IS:961 : Recommended current rating for Cable.
41) IS:1653 : Rigid steel conduits for electrical wiring.
42) IS:2667 : Fittings for rigid steel conduits for electrical wiring.
43) IS:3480 : Flexible steel conduit for electrical wiring.
44) IS:3837 : Accessories for rigid steel conduits for electrical wiring.
45) IS:694 : PVC insulated cables (wires).
46) IS:2509 : Rigid non-metallic conduits for electrical wiring.
47) IS:6946 : Flexible (playable) nonmetallic conduits for electrical installation.
48) IS:1293 : Three pin plugs and sockets.
49) IS:8180 : Conductors for insulated electrical cables and flexible codes.
51) IS:3419 : Accessories for non-metallic conduits for electrical wiring.
52) IS:3854 : Switches.
53) IS:6538 : Plugs.
54) IS:2834-1954 : Shunt Capacitors for power systems.
55) IS:2208 : HRC cartridge fuse and links up to 660 volts.
56) IS:1913-1969 : General and safety requirement for lighting fittings.
58) IS:3528 : Waterproof electric lighting fittings.
60) IS:1239-1958 : Mild Steel tubular and other wrought steel pipe fitting.
64) IS:9224 : HRC fuses having rupturing capacity of 90 KA.

NOTE: All codes and standards means the latest where not specified otherwise the installation shall generally follow the Indian Standard codes of practice or relevant British Standard Codes of Practice in the absence of corresponding Indian Standards.

PLEASE FOLLOW:

a. Indian Electricity Act of 1910 and rules issued there under revised up to date.
b. Special Attention should be given to Rule No. 50.
c. Regulations for electrical equipment in building issued by The Bombay Regional Council of insurance Association of India.
ELECTRICAL MATERIAL SPECIFICATION

DISTRIBUTION BOARDS

The scope of work shall cover supply, installation testing and commissioning of all distribution boards.

Standards:

AS PER SCHEDULE OF INDIAN STANDARDS, ATTACHED IN THE DOCUMENT.

Distribution Boards:

Distribution boards along with the controlling MCB’s/Fuse or Isolator as shown shall be fixed in an M.S. Box with hinged door suitable for recessed mounting in wall. Distribution boards shall be made of 18 SWG steel sheet duly rust inhibited through a process of de-greasing, acid pickling, phosphate and powder coated to an approved color of adequate micron rating duly approved by architect/consultant.

Three phase boards shall have phase barriers and a wire channel on three sides. Neutral bars shall be solid tinned copper bars with tapped holes and chase headed screws. For 3 phase DB’s, 3. independent neutral bars shall be provided. All DB’s shall be internally pre-wired using copper insulated PVC wires brought to a terminal strip of appropriate rating for outgoing feeders.

Conduit knockouts shall be provided as required/shown on drawings and the entire board shall be rendered dust and vermin proof with necessary sealing gaskets. The top and bottom side of DB should be detachable.

MCB’s shall have quick make and break non-welding self wiping silver alloy contacts for 10 KA short circuit both on the manual and automatic operation. Each pole of the breaker shall be provided with inverse time thermal over load and instantaneous over current tripping elements, with trip-free mechanism. In case of multi-pole breakers, the tripping must be on all the poles and operating handle shall be common. Breakers must conform to BS 3871 with facility for locking in OFF position. Pressure clamp terminals for stranded/solid conductor insertion are acceptable up to 4 sq.mm. aluminum or 2.5 sq.mm. copper and for higher ratings, the terminals shall be suitably shrouded. Wherever MCB isolators are specified they are without the tripping elements.

Fuses shall be HRC link type re-wire able with necessary fuse carriers and with rating of not less than 25 MVA. Bottle type fuses are not acceptable. Fuse carrier terminals shall be suitably shrouded. Re-wireable fuse carriers shall be porcelain. HRC fuses for motor duty should be time lag type.

Distribution boards shall have HRC/re-wire able fuses as shown on the schedule and drawings. Board shall meet with the requirements of IS 2675 and marking arrangement of bus bars shall be in accordance with I.S. standards.
Bus bars shall be suitable for the incoming switch rating and sized for a temperature rise of 35° C over the ambient. Each board shall have two separate earthing terminals. Circuit diagram indicating the load distribution shall be pasted on the inside of the DB as instructed. One earthing terminal for single phase and two terminals for 3 phase DB’s shall be provided with an earth strip connecting the studs and the outgoing ECU earth bar.

In the case of MCB distribution boards, the backup fuses wherever shown shall be not less than 63 A with a delayed characteristic and a minimum pre-arcing time of 0.5 sec. At 9 KA/3 KA fault current.

All outgoing feeders shall terminate on a terminal strip which in turn is interconnected to the MCB/Fuse base by means of insulated single conductor copper wires as follows:

<table>
<thead>
<tr>
<th>Up to 15 A</th>
<th>2.5 sq.mm.</th>
<th>40 A</th>
<th>10 sq.mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 A</td>
<td>4.0 sq.mm.</td>
<td>63 A</td>
<td>16 sq.mm.</td>
</tr>
<tr>
<td>32 A</td>
<td>6.0 sq.mm.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RCCB / MCB:**

The RCCB should suffices all the requirements of IS as per code IS – 12640 – 1988. The RCA should be current operated and not on line voltage.

The RCCB should ensure mainly the following functions.

- Measurement of the fault current value.
- Comparison of the fault current with a reference value.

The RCCB should have a toroidal transformer witch has the main conductors of primary (P – N) which check the sum of the current close to zero.

All metal parts should be inherently resistant to corrosion and treated to make them corrosion resistant.

- It should be truly current operated.
- It should operate on core balance toroidal transformer.
- It’s accuracy should be ± 5 %.
- It should operate even in case of neutral failure.
- It should trip at a present leakage current within 30 M.S.
- It’s enclosure should be as per IP 30.
- It’s mechanical operation life should be more than 20,000 operations.

It should provide full protection as envisaged by IE rules – 61-A, 71 – ee, 73 – ee, 1985 and also rule 50 of IE rule 1956.

It should conform to all national and international standards like IS 8828 : 1993, IS 12640 – 1988, BS 4293 – 1983, CEE 27 (International commission Rules for the approved of electrical equipment).
MEDIUM VOLTAGE CABBING

Scope:

The scope consists of laying & testing L. T. Cable and its termination.

Standards:

AS PER SCHEDULE OF INDIAN STANDARDS; ATTACHED IN THE DOCUMENT

Cables:

All cables shall be 1100 Volt grade XLPE insulated, sheathed with or without steel armoring as specified and with an outer PVC protective sheath. Cables shall have high conductivity stranded aluminum or copper conductors and cores color coded to the Indian Standards. All cables laid up to load should be without any joint.

All cables shall be new without any kind or visible damage. The manufacturer’s name, insulating material, conductor size and voltage class shall be marked on the surface of the cable at every 600 mm centers.

Cable joints and termination:

Connectors:

Cable terminations shall be made with copper Heavy duty long neck copper crimping lugs only crimped type solderless lugs for all aluminum cables and stud type terminals. For copper cables copper crimped solderless lugs shall be used. Crimping shall be done with the help of hydraulically operated crimping tool. All cable lugs should be long neck type only.

Cable Glands:

Cable glands shall be of heavy duty brass single compression type as specified. Generally single compression type cable glands shall be used for indoor protected locations and double compression type shall be used for outdoor locations. Glands for classified hazardous areas shall be CMRS approved.

Ferrules:

Ferrules shall be of self-sticking type and shall be employed to designate the various cores of the control cable by the terminal numbers to which the cores are connected, for ease in identification and maintenance.

Cable joints:

Kit type joint shall be done and filled with insulating compound. The joint should be for 1.1 KV grade insulation.
CONDUIT WIRING

1.0 Scope:

1.1 The scope of work shall cover supply, installation testing and commissioning of all.

2.0 Standards: As per annexure - iv

3.0 Rigid and Flexible conduits:

3.1 All PVC conduits shall be laid in open/concealed manner which are approved by F.I.A. & I.S.I. & of 25 mm. Diameter.

3.2 Flexible conduits shall be formed from a continuous length of spirally wound interlocked steel strip with a fused zinc coating on both sides. The conduits shall be terminated in brass adapters.

4.0 Accessories:

4.1 PVC conduit fittings such as bends, elbows, reducers, chase nipples, split couplings, etc. shall be specifically designed and manufactured for their particular application. All conduit fittings shall conform to IS:2667-1974 and IS:3887-1966. All fitting associated with galvanized conduit shall also be galvanized.

5.0 Wires:

5.1 All wires shall be single core multi-strand flexible copper or single strand Aluminum/Copper, PVC insulated as per IS:694 and shall be 660v/1100V grade.

5.2 All wires shall be color coded as follows:

<table>
<thead>
<tr>
<th>Phase</th>
<th>Colour of wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Red</td>
</tr>
<tr>
<td>Y</td>
<td>Yellow</td>
</tr>
<tr>
<td>B</td>
<td>Blue</td>
</tr>
<tr>
<td>N</td>
<td>Black</td>
</tr>
<tr>
<td>Earth</td>
<td>Green (insulated)</td>
</tr>
<tr>
<td>Control (If any)</td>
<td>Grey</td>
</tr>
<tr>
<td>All off wires</td>
<td>Same as Phase wire</td>
</tr>
</tbody>
</table>

5.3 Color code should be strictly used for all wiring.

ii) Installation, commissioning and testing.

iii) Cable marking.

For cable buried underground:

i) Cables and protective bricks & tiles.

ii) Installation, commissioning & testing.

iii) Cable markers.

For SHREE LAKSHMI ELECTRO-TECH
6.0 **Switches & Sockets:**

6.1 Switches shall be module type/ flush piano type with silver-coated contacts. Sockets shall be 3 pin with switch and plate type cover. Combination of multiple switch units and sockets should be used to minimize the switch boxes.

6.2 For heavy duty, metal clad sockets with M.C.B./ Isolator mounted in a galvanized steel box shall be provided.

7.0 **Installation:**

7.1 Conduits shall be kept at a minimum distance of 100 mm. From the pipes of other non-electrical services. And maintain minimum 300 mm distance between telephone, TV & Computer piping.

7.2 Separate conduits/raceways shall be used for:
   1. Normal lights and 5 A 3 pin sockets on lighting circuit.
   2. Separate conduit shall be laid from D.B. to switch board or point.
   4. Emergency lighting.
   5. Telephones.
   6. Fire alarm system.
   7. Public address system & Music system.
   8. For all other voltages higher or lower than 230 V.
   9. T.V. Antenna.
   10. Water level guard.

7.3 Call bell wiring layout of conduits shall be generally indicated on drawings and the layout shall be supplemented and complemented by contractor on site with approval of the Engineer.

7.4 Wiring for short extensions to outlets in hung ceiling or to vibrating equipments, motors etc., shall be installed in flexible conduits. Otherwise rigid conduits shall be used. No flexible extension shall exceed 1.25 m.

7.5 Conduits run on surfaces shall be supported on metal 12 mm. thick saddles which in turn are properly screwed to the wall or ceiling. Saddles shall be at intervals of not more than 500 mm. Fixing screws shall be with round or cheese head and of rust-proof materials. Exposed conduits shall be neatly run parallel or at right angles to the walls of the building. Unseemly conduit bends and offsets shall be avoided by using fabricated mild steel junction/pull through boxes for better appearances. No crossover of conduits shall be allowed unless it is necessary and entire conduit installation shall be clean and neat in appearance.

7.6 Conduits embedded into the walls shall be fixed by means staples at not more than 500 mm. intervals. Chases in the walls shall be neatly made and refilled after laying the conduit and brought to the finish of the wall but final finish will be done by the building contractor. The contractor shall provide wire mesh before making rough plaster.
7.8 Conduits buried in concrete structure shall be put in position and securely fastened to the reinforcement and got approved by the Engineer, before the concrete is poured. Proper care shall be taken to ensure that the conduits are neither dislocated nor choked at the time of pouring the concrete suitable fish wires shall be drawn in all conduits before they are embedded.

7.9 Inspection boxes shall be provided for periodical inspection to facilitate withdrawal and removal of wires. Such inspection boxes shall be flush with the wall or ceiling in the case of concealed conduits. Inspection boxes shall be spaced at not more than 12 meters apart or two 90° solid bends or equal. All junction and switch boxes shall be covered by 6 mm. clear Perspex plate truly cut and fixed with cadmium plated brass screws. These junction boxes shall form part of point wiring or conduit wiring as the case may be including the cost of removing the Perspex cover for painting and re-fixing. No separate charges shall be allowed except where specially mentioned.

7.10 Conduits shall be free from sharp edges and burrs and the threading free from grease or oil. The entire system of conduits must be completely installed and rendered electrically continuous before the conductors are pulled in. Conduits should terminate in junction boxes of not less than 32 mm. deep.

7.11.1 An insulated earth wire of copper rated capacity shall be run in each conduit for entire length.

8.0 Lighting & Power Wiring:

8.1 All final branch circuits for lighting and appliances shall be single conductor/stranded/flexi-cables run inside conduits. The conduit shall be properly connected or jointed into sockets, baps, and junction boxes.

8.2 All circuits shall preferably be kept in a separate conduit up to the Distribution Board. No other wiring shall be bunched in the same conduit except those belonging to the same phase. Each lighting branch circuit shall not have more than ten outlets or 800 watts whichever is lower. Each conduit shall not hold more than three branch circuits of same phase.

8.3 Flexible cords for connection to appliances, fans and pendants shall be 650/1100V grade (three or four cores i.e. with insulated neutral wire of same size) with tinned stranded copper wires, insulated, twisted and sheathed with strengthening cord. Color of sheath shall be subject to the Engineer’s approval.

8.4 Looping system of wiring shall be used. Wires shall not be jointed. Where joints are unavoidable, they shall be made through approved mechanical connectors. No such joints shall be made unless the length of the sub-circuit, sub-main or main is more than the length of the standard coil.

8.5 Control switches shall be connected in the phase conductors only. Switches shall be fixed in 3 mm. thick painted or galvanized steel boxes with cover plates as specified. Cadmium plated brass screws shall be used.
8.6 Power wiring shall be distinctly separate from lighting wiring. Conduits not less than 25 mm. and wires not less than 2.5 sq. mm. copper shall be used.

8.7 Every conductor shall be provided with identification ferrules at both ends matching the drawings.

9.0 Testing:

9.1 The entire installation shall be tested for:
   a) Insulation resistance.
   b) Earth continuity.
   c) Polarity of single pole switches.

A test certificate shall be submitted in the Performa shown under Appendix – I.

10.0 Mode of measurement:

10.1 The definition of point wiring shall be in accordance with sketch drawing and should wiring from D.B. onwards together with all junction boxes, connectors, earth wire, fixing accessories, connection to all light fittings switches etc. as specified and shown on drawings. The point rate shall include circuit wiring from distribution board to switch board and/or directly to the point. The circuit wire shall be in separate conduit. The contractor may draw maximum 2/3 circuits of the same phase in circuit mains conduit.

10.2 All switches sockets with boxes, earthing interconnection and plate type silver contact switch shall be inclusive in point wiring.

10.3 All empty conduit runs, including junction boxes fish wires etc. shall be paid on the basis of unit length.

Measurements shall be along the conduit and concurrent length of sub-circuit wiring.

10.4 Buzzer indicator of the ways specified shall consist of indicating lamps, reset button, electromagnet, Perspex cover plate, chromium plated brass screws etc. shall be considered as on unit for measurement and payment.

10.5 Two way light points shall be classified according to and consist of 2 Nos. 2 way plate type switches, wiring from the 1st 2 way switch to the 2nd 2 way switch to the first light controlled. Subsequent lights, if any, shall be measured as ordinary secondary point.

EARTHING
Scope:

The Scope of work shall cover supply of earthing stations, laying copper earth strips and connecting the power panels, DB’s and switch boards.
Standards:
AS PER ANNEXURE - IV.

Plate Earthing Station:
The substation earthing shall be with copper plate earthing station unless otherwise specified.
The earthing station shall be as shown on the drawing. The earth electrodes shall be 450 x 450 x 3 mm / 600 x 600 x 6 mm. Copper plate – as specified in B.O.Q. The earth resistance shall be maintained with a suitable soil treatment as shown on drawings.
The resistance of each earth station should not exceed 1 ohms.
The earth lead shall be connected to the earth plate through copper/brass bolts as shown on the drawing.
Minimum distance between two earth pits shall be 2 Mts.
All earth pits shall be minimum 1 Mt. Away from building foundation.

Pipe Earthing Station:
The earth station shall be as shown on the drawing and shall be used for equipment earth grid. The earth electrode shall be 2.5 m. long 50 mm. Diameter galvanized steel pipe. The earth resistance shall be maintained with a suitable soil treatment as shown on drawings.
The resistance of each earth station should not exceed 5 ohms.
The earth lead shall be fixed to the pipe with a and safety set screws. The clamps shall be permanently accessible.

Earth leads and connections:
Earth lead shall be bare copper or aluminum or galvanized steel as specified with sizes shown on drawings. At road crossings necessary Hume pipes shall be laid. Earth lead run on surface of wall or ceiling shall be fixed on saddles or wall.
The complete earthing system shall be mechanically and electrically bonded to provide an independent return path to the earth source.

Equipment Earthing:
All apparatus and equipment transmitting or utilizing power shall be earthed in the following manner. Copper earth wires shall be used unless otherwise indicated in the schedule of work and drawings.

Power transmission apparatus:
Metalllic conduit shall not be accepted as an earth continuity conductor. A separate insulated/bare earth continuity conductor of size 50% of the phase conductor subject to the minimum and maximum shall be provided.

Non-metallic conduit shall have an insulated earth continuity conductor of the same size as for metallic conduit. All metal junction and switch boxes shall have an inside earth stud to which the earth conductor shall be connected. The earth conductor shall be distinctly colored (green) for easy identification.
In the case of cable, an earth continuity conductor shall either be run outside along the cable or should form a separate insulated core of the cable.

Three Ph. Power panels and distribution boards shall have 2 distinct earth connections of the size correlated to the incoming cable size. In case of 1 Ph. DB’s a single earth connection is adequate. Similarly for 3 Ph and 1 Ph isolating switches there shall be 2 and 1 earth connections respectively, sizes being correlated to the incoming cable.

**Testing:**

The following earth resistance values shall be measured with an approved earth meggar and recorded.

- Each earthing station
- Earthing system as a whole
- Earth continuity conductors

**Mode of measurements:**

Providing earthing station complete with excavation, electrode, watering pipe, soil treatment, masonry chamber with cast iron cover etc. shall be treated as one unit of measurement.

The following items of work shall be measured and paid per unit length covering the cost of the earth wires/strip clamps, labor etc.

- Main equipment earthing grid and connections to the earthing stations.
- Connections to the switchboard, power panels, distribution boards etc.
- The cost of earthing the following items shall become part of the cost of the item itself and no separate payment for earthing shall be made.
- Isolating switches and starters should form part of mounting frame, switch starter etc.
- Light fittings – form part of installation of the light fitting.
- Conduit wiring cabling – should form part of the wiring or cabling.

**TELEPHONE DISTRIBUTION**

This cover supply, installation, testing, commissioning of telephone system.

1) The scope of work shall cover supply, installation, commissioning and testing of:

   - Telephone cables
   - Telephone Tag Blocks
Telephone wiring in conduits

The telephone exchange and the hand sets shall be supplied by the clients.

2) **Conduits:**

Conduits shall be as given below:

Indoor: medium gauge Rigid PVC conduit.
If in flooring provide heavy gauge.
The conduit shall generally be as specified under section ‘CONDUIT WIRING’.

3) **Cables and Wires:**

The type of cables and the services shall be as follows:

Indoor Multi pair, PVC insulated sheathed armored and sheathed.

Inside Twin core PVC insulated with conduit twisted cores.

All multi core cables and wires shall be of tinned copper conductor of not less than
0.5 mm dia and shall be color coded twisted pairs with rip cord.

The conductor resistance shall be less than 150 ohms per KM and the insulation resistance
between the conductors not less than 50 mega ohms and the nominal capacitance of
about 0.1 micro farad per kilometer.

Cables laid underground or locations subject to dampness and flooding shall be filled with
polyethylene compound and shall have sufficient protection against moisture and water
ingress.

All armoring shall be of galvanized steel wires and protected against corrosion by an outer
sheath of PVC in the case of indoor cables and polyethylene in the case of outdoor cables.
Outer sheathing must be fire retarding and anti-termite.

All unarmored single core cables and inner sheath of armored cables shall be provided
with rip cord.

All single pair cables for final extension to the telephone outlet box shall be unarmored tinned
copper conductors of not less than 0.6 mm. Diameter and shall be drawn in conduits. All
telephone outlets shall consist of 2 A 2 pair polythene connector in G.1 box with 6 mm bus
bar cover with bus bar edges and chromium plated brass hardware.

**Tag blocks:**

The telephone tag blocks shall be suitable for the multi core telephone cables and shall have
two terminal blocks, cross connect type. All incoming and outgoing cables shall be
terminated on separate terminal blocks and termination shall be silver soldered. The cross connecting jumpers shall be insulated wires of same diameter and screw connected.

The tag blocks shall be mounted inside fabricated sheet steel boxes with removable hinged covers and shall be fully accessible. The enclosure shall be painted with 2 coats of red oxide and stove bus bar.

**Installation:**

The installation of conduits shall generally be as specified under section 'CONDUIT WIRING'.

Telephone / Data pipes shall be kept 100 from power conduit.

Separate J.B. shall be provided for telephone & Computer.

All cables shall be on cable racks and neatly stitched together.

The connection at the tag blocks shall be silver soldered so as to achieve minimum contact resistance.

The final branch connections with single pair cables in conduits and the maximum number of cables in each conduit shall be as follows:

<table>
<thead>
<tr>
<th>Conduit diameter (inch)</th>
<th>Max. No. of cables (mm.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾&quot; 20</td>
<td>2 Nos. single pair</td>
</tr>
<tr>
<td>1&quot; 25</td>
<td>6 Nos. single pair</td>
</tr>
<tr>
<td>1¼&quot; 32</td>
<td>12 Nos. single pair</td>
</tr>
<tr>
<td>1½&quot; 40</td>
<td>18 Nos. single pair</td>
</tr>
</tbody>
</table>
INSTALLATION TESTS CERTIFICATE

BY ELECTRICAL CONTRACTOR

This contractor is to certify that the work is carried out work confirming to IE Rules and code of practice. He has to give the test report is under.

(i) Insulation Resistance test is

R - N M. Ohms
Y - N M. Ohms
B - N N. Ohms

(ii) Load test:

5A - 1000 W Power Point - 15 Minutes
15A - 3000 W Power Point - 15 Minutes

(iii) Earth resistance for each electrode

- 0.2 Ohm
- 0.3 Ohm
- 4 - N - E Volts

(iv) Certificate of makes of materials used in the work

(v) Circuit diagram

(vi) Certified that the electrification work has been carried out under the supervision of licensed Electrical supervision.

(vii) Certified that the earthing plate / pipe has been verified and placed at correct depth confirming to IE Rules.

Signature of Electrical Supervision  Signature of Contractor

Name:

License No.:
IMPORTANT POINTS TO BE NOTED

1) Rates for LIGHT, FAN, EX. FAN, CALL BELL, RAW POWER ETC. POINTS includes the cost of main wires and PVC pipes from LDB-ROW POWER DB to DIFFERENT SWITCHBOARDS WITH REQUIRE CIRCUITS.

2) Rates for COMPUTER POWER POINTS include the cost of wires and PVC pipes from UPS DB to COMPUTER POWER POINTS.

3) Rates for COMPUTER I/O include the cost of DATA cables and PVC pipes from SERVER SWITCH to COMPUTER NODES.

4) Rates for TELE POINTS include the cost of TELEPHONE Wires and PVC pipes from EPABX/CRONE BOX to TELE. POINTS.

5) Rates for A.C. / POWER POINTS include the cost of wires and PVC pipes from A.C.DB to DIFFERENT A.C. AND POWER POINTS WITH REQUIRE CIRCUITS.

6) THE CONTRACTOR SHOULD SUBMIT THE BUILTUP SLD OF PANEL, SLD OF DIFFERENT DBS TO DIFFERENT SWITCHBOARDS WITH NUMBERING, SLD OF DATARACK TO DIFFERENT I/O POINTS WITH NUMBERING, TELE. CRONE BOX TO DIFFERENT TELE. POINTS WITH NUMBERING, ETC. AFTER EXECUTION OF THE BRANCH. – 2 SETS OF COPIES – 1 WITH LAMINATION.

7) THE CONTRACTOR SHOULD USE MAX. CIRCUITS IN ONE CONDUIT FOR UPS & RAW POWER POINTS As per Conduit Capacity.

8) THE CONTRACTOR SHOULD USE MAX. WIRES OF DATA & TELE. IN ONE CONDUIT as per conduit capacity.

9) EVERY CONDUIT FOR UPS, RAW POWER, DATA & TELE., POWER POINTS, AC POINTS, LIGHTING POINTS SB SHOULD BE SEPARATE as far as possible.

10) FOR DATA & TELE. POINTS, BIG JUNCTION BOX MUST BE REQUIRED.

11) FOR UPS & RAW POWER POINTS, BIG/ SMALL JUNCTION BOX MUST BE REQUIRED.

12) EMPTY CONDUIT MUST BE LAID FOR SECURITY SYSTEM.

13) PVC CONDUITS MUST BE CLAMPED WITH SADDLES IN CEILING ONLY.

14) ELE. CONTRACTOR MUST SUBMIT CERTIFIED LOAD LIST WITH ELE. LICENSE NO. / SUPERVISOR CERTIFICATE NO.

15) CONTRACTOR SHOULD SUBMIT TEST REPORT.

16) CONTRACTOR SHOULD PRESENT EARTHING PLATES BEFORE EX

Approved Make Of Materials As Given At the end of B.O.Q. may be used. For items not covered under I.I.T. Approved List following table may be referred.
<table>
<thead>
<tr>
<th>1</th>
<th>PVC rigid conduits &amp; Accessories</th>
<th>1.5 mm thick ISI and FIA approved - Precision / Universal/ VIP/ Prestoplast/Aeroplast/Modi/A.K.G make.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>L.T. Cables</td>
<td>RR Kable/ Finolex./Poly Cab/Havells</td>
</tr>
<tr>
<td>3</td>
<td>Wires (FRLS)</td>
<td>RR Kable/ Finolex./Poly Cab/Havells/Anchor</td>
</tr>
<tr>
<td>4</td>
<td>Main Distribution Boards</td>
<td>Legrand / Indo Asian/ Hagger / Schneider / ABB/ L &amp;T / Havells</td>
</tr>
<tr>
<td>5</td>
<td>Miniature Circuit Breaker</td>
<td>Legrand / Indo Asian/ Hagger / Schneider / ABB/ L &amp;T / Havells</td>
</tr>
<tr>
<td>6</td>
<td>ELCB / RCCB</td>
<td>Legrand / Indo Asian/ Hagger / Schneider / ABB/ L &amp;T / Havells</td>
</tr>
<tr>
<td>7</td>
<td>Switch gears / MCCB</td>
<td>MDS Legrand / Hager / Schneider /ABB/Havells L&amp;T</td>
</tr>
<tr>
<td>8</td>
<td>Change Over Switch</td>
<td>HPL / ABB/ Standard / L &amp; T.</td>
</tr>
<tr>
<td>9</td>
<td>Domestic fittings</td>
<td></td>
</tr>
<tr>
<td>a) 5A one / two way switch</td>
<td>MK / Schneider / L &amp; T / Legrand / Havells/Elley/Crabtree/Salzer</td>
<td></td>
</tr>
<tr>
<td>b) 5A 5 pin socket</td>
<td>MK / Schneider / L &amp; T / Legrand / Havells/Elley/Crabtree/Salzer</td>
<td></td>
</tr>
<tr>
<td>c) 16A one / two way switch</td>
<td>MK / Schneider / L &amp; T / Legrand / Havells/Elley/Crabtree/Salzer</td>
<td></td>
</tr>
<tr>
<td>d) 6A/16A socket</td>
<td>MK / Schneider / L &amp; T / Legrand / Havells/Elley/Crabtree/Salzer</td>
<td></td>
</tr>
<tr>
<td>e) fan step regulator</td>
<td>MK / Schneider / L &amp; T / Legrand / Havells/Elley/Crabtree/Salzer</td>
<td></td>
</tr>
<tr>
<td>f) Telephone RJ - 11 socket + Box</td>
<td>MK / Schneider / L &amp; T / Legrand / Havells/Elley/Crabtree/Salzer</td>
<td></td>
</tr>
<tr>
<td>g) Holders / ceiling roses</td>
<td>Anchor / Maru make.</td>
<td></td>
</tr>
<tr>
<td>h) Adhesive Tape</td>
<td>Bhor (Steel Grip) or approved</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Telephone Wires / Cable</td>
<td>Finolex / R. R. Kable / Havells / L &amp; T./Krone</td>
</tr>
<tr>
<td>11</td>
<td>Telephone tag block</td>
<td>Krone make.</td>
</tr>
<tr>
<td>12</td>
<td>Cable Lugs</td>
<td>Dowell / Lotus / Jainson / 3 D./Usha/Brecco/Cosmos</td>
</tr>
<tr>
<td>13</td>
<td>Cable gland Single / Double Compression</td>
<td>HMI / Comet / 3D.</td>
</tr>
<tr>
<td>14</td>
<td>Ammeter / Voltmeter</td>
<td>AE / HPL /MECO/ Enercon make.</td>
</tr>
<tr>
<td>15</td>
<td>Selector switches</td>
<td>L &amp; T salzer / Kayce make.</td>
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<tr>
<td>-----</td>
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</tr>
<tr>
<td>16</td>
<td>Indicator lamps</td>
<td>LED type Teknic / Precifine/ Binay.</td>
</tr>
<tr>
<td>17</td>
<td>Connector strips</td>
<td>Wago / Elmex make.</td>
</tr>
<tr>
<td>18</td>
<td>Lighting Fixtures</td>
<td>Wipro / Philips / GE / Crompton/Havells/C&amp;S/Plycab/Syska</td>
</tr>
<tr>
<td>19</td>
<td>Exhaust fan (Light duty)</td>
<td>Usha/ Crompton / Havells./Bajaj Armond</td>
</tr>
<tr>
<td>20</td>
<td>Ceiling Fan</td>
<td>Usha/ Crompton / Havells./Bajaj Armond</td>
</tr>
<tr>
<td>21</td>
<td>Wall mounted Fan</td>
<td>Crompton / Khaitan / Havells / Luminious.</td>
</tr>
<tr>
<td>22</td>
<td>Data Cable - I / O Unit</td>
<td>D - Link.</td>
</tr>
</tbody>
</table>

**LIGHTING FIXTURES - SEE CAT NO. & SPECIFIED MAKE IN THE FINANCIAL BID. OR APPROVED EQUIVALENT AS PER APPROVED MAKE LIST DIRECTED BY ARCHITECT/ BANK**

Note:

[a] Where other Material are proposed to be used these should be got Approved from the Architect/Consultant before execution of particular item. In case of Non- Availability of any material of specified make, The Alternative should be used only after it is Approved in writing by the Employer or the Architect./Consultant. The Material shall be used in preferential Order only.

[b] Before starting of work contractor must get all samples/make approved from Architect before using at site.

[c] Consultants reserve the right to add or delete name of any manufacture as and when required.

[d] Consultants reserve rights to select any of the specified brands mentioned above.

FOR SHREE LAKSHMI ELECTRO-TECH.