TECHNICAL SPECIFICATION FOR ELECTRICAL WIRING / PANELS / SWITCH GEAR

1.0 GENERAL REQUIREMENTS

The installation shall generally be carried out in conforming with the requirements of the Indian Electricity Act, l9l0 as amended up to date and the Indian Electricity Rules, l956 framed there under, the relevant regulations of the Electric Supply Authority concerned, and also with the specifications laid down in the Indian Standard I.S. 732 - l963 Code of Practice (revised) for Electrical Wiring Installations (system voltage not exceeding 650 volts) and I.S. 2309-1969 Code of Practice for the protection of Buildings and Allied Structure against Lighting and IS 3043 - Indian code of Practice for Earthing. The wiring shall also be according to the I.S specifications, NEC, Local Government Body. Only the contractor having valid Electrical Contractor Licence of the State shall be eligible to execute the same. The contractor shall be responsible for renewal of the same at the appropriate time.

2.0 MATERIALS

All materials, fittings, appliances, used in electrical installations, shall conform to Indian Standard Specifications wherever these exist. A list of approved materials is attached afterwards. Materials not included in the list shall be got approved by the Engineer-in-Charge/Owner prior to actual use.

3.0 MAIN SWITCH GEAR

Iron clad switch fuse and isolator units should conform to relevant I.S. Standard. The quick make and break mechanism shall be self interlocked with the cover. In "Off" position there must be two breaks per pole.Main switch gear shall be properly earthed with two numbers conductors if M.V and one
number of L.V.

4.0 BUSBAR CHAMBER (B.B.C)

This shall be totally enclosed, metal clad type fabricated from rust proofed l6 SWG sheet steel on angle iron frame and provided with sheet steel or cast iron detachable front cover and undrilled detachable end plates, suitable for mounting on wall or angle iron floor stand and painted with high quality enamel paint. G.I. bolts and nuts shall be used for assembly with suitable packing materials to ensure dust proof finish. Meters shall beprovided on suitable sheet steel boxes. Switch shall be provided with cable end boxes as required.
The depth of B.B.C. shall be 250 mm (minimum). Minimum clearance of phase bars to earth shall be 26 mm and between bus bars shall be minimum 32 mm.
H.C. (High conductivity) copper busbars properly tinned are to be rated at l000 Amps. Per sq. in and Aluminium bus bars (wrought aluminium alloy strip) cnforming to relevant I.S.specification at 800 Amps per sq.in.Neutral Busbars are to be rated to carry 100% of phase current upto 200A and 60% for higher. These shall be mounted on DMC/SMC supports of proper dielectric and mechanical strength and shall be appropriately colour coded for identification of Phase with PVC sleeves of 1.1 KV grade throughout the length.
Technical Specification 63
Lettering shall be done for identification of switches as directed. The contractor shall submit fully dimensioned drawing of the board with the physical position of the switches and other components to the Owner for their approval before the same is fabricated.
There shall be two nos of Earth Terminals. Suitable Danger Board shall be provided.

5.0 INTERCONNECTION IN B.B.C, SWITCH FUSE, METERS
For ratings above 150 Amps these shall consist of insulated copper strips of adequate section considering current density as specified in Clause 4 above. For rating below 150 Amps PVC copper cable tails of appropriate size, terminating in tinned copper sockets may be used considering 1.5 Amp/sq.mm for copper & 1.0 Amp/sq.mm for aluminium.
The above are to be enclosed either in sheet metal trunking or conduits so that no part is exposed.

6.0 DISTRIBUTION BOARDS
These totally enclosed metal clad type Distribution Boards with hinged lids shall be in accordance with I.S. 2147 - 1952 and 2675 - l966 and B.S. 2l4 and shall be of welded construction and fabricated from rust proofed sheet steel and finished with anticorrosive stove enamel paint and have provision for fixing on wall and have earthing terminals/terminals.
Power Distribution Boards (415 volts TPN) shall be constructed from l6 SWG sheet steel and Branch Distribution Boards (230 volts SPN from l8 SWG sheet steel).
The MCB shall be mounted on Din rails supports of proper dielectric & mechanical strength. If fuses/fuse banks are used these shall be mounted on moulded DMC/SMC or ebonite supports of proper dielectric and mechanical strength. TPN units should have phase separation barriers.
Cables shall be connected to a terminal by crimped lugs.
Where two or more B.D.B's feeding low voltage circuits are fed from different phases of a medium voltage supply, these B.D.B's shall be installed at least two metres apart or otherwise in a different direction to prevent access to the both DBs at a time.
All three phase power distribution boards shall be properly earthed as per relevant I.E. rules and provided with suitable Danger Board. All SPN B.D.B's shall be properly earthed with one number l0 SWG galvanised iron wire each or with insulated copper PVC wire of adequate ratings in case of concealed wiring as per the specifications.

7.0 SWITCHES
All switches for lights, fans and plug points shall be piano type switches, unless specified otherwise.

8.0 CABLES AND CONDUCTORS
All cables shall conform to I.S-692, IS-7098, IS-1554 (Part-I) 1964 and IS 694-1990 or latest . Conductors of all cables except for flexible cables, shall be of aluminium, unless specified otherwise.
Technical Specification 64

9.0 FLEXIBLE CABLES
Conductors of flexible cables shall be of copper. The minimum size of core acceptable is 1.50 sq.mm.

10.0 INSTALLATION OF MAIN SWITCH BOARD, BDB'S MAINS, SUBMAINS, DISTRIBUTION WIRING TO INDIVIDUAL POINTS
The exact positions of all main switch board, BDB's and all runs of mains and submains, and distribution wirings to individual points including the exact position of all light fittings and switch boards shall be first marked on the buildings and shall be approved by the Engineer-in-Charge before actual commencement of the work.
The D.Bs shall generally be installed at a height of 2.l3 m (7 ft) from floor level.

11.0 INSTALLATION OF SWITCH BOARDS

These shall be installed at a height of l.3 mtrs (4'-3") and above the floor level.

12.0 INSTALLATION OF FLUORESCENT LIGHT FITTINGS :

Where these are suspended from ceiling by two down rods, or fixed to ceiling/beam directly, at least one fixing to the ceiling/beam shall be made with Mechanical/Metal fasteners. Electrical drill only shall be used while making holes for the fasteners which shall be capable of sustaining at least 15 kg of dead weight.

The down rods and accessories shall be painted with approved paint without involving extra cost.

Unless otherwise specified these should be suspended 2.60 M (8'-6") above the floor or as per direction of Owner to match interiors.

13.0 INSTALLATION OF SOCKET OUTLETS

No socket outlet shall be provided in the bath room at the height less than l30 cms (4'-3") from the floor.

No switches shall be provided inside the bath rooms, unless approved by the Engineer-in-Charge.

Socket outlet at locations other than bath rooms shall be either 25 cms (l0") or 130 cms (4'-3") from the floor.

14.0 ELECTRICAL PANELS

a) Before fabrication, drawings of electrical panels will have to be got approved by the Employer/Architects.

b) Panels will be inspected at works and approved by the Employer/Architect's prior to despatch.

c) Panel fabricator should be ISO certified or having test certificates from CPRI for panels built in their works where, the panel values exceeds Rs. 2 Lacks.

d) Panels should be tested for insulation resistance and HV withstand test. Factory test certificates should be provided.

15.0 TESTING OF INSTALLATION

Before a completed installation or an addition to an existing installation is put into service, the following tests shall be carried out by the contractor in presence of the Engineer-in-Charge/Owner's/Architect's representative.

a) Polarity of switches

It must be ensured by test that all single pole switches have been fitted on the live side of the circuits they control.

b) Insulation Test :

i) By applying a 500 volt megger between earth and the whole system of conductors or any section thereof, with all fuses in place and all switches closed, all lamps in position or both poles of installation otherwise electrically connected together :- The result in meghom shall not be less than 50 divided by the number of points on the circuit, and should not be less than 1 meghom.

ii) Between all conductors connected to one phase and all such conductors connected to the neutral or to the other phase conductors of the supply after removing all metalic connections between the two poles of the installation and switching on all switches. The insulation resistance shall be as in (i) above.

c) Earth continuity Test

The earth continuity conductor including metal conduits, and metal sheaths of cables in all cases shall be tested for electrical continuity. Electrical resistance of the above along with the earthing lead but excluding any resistance of earth leakage circuit

breaker, measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

d) Earth Resistance Test

To ensure effectiveness of installation earth, the value of earth resistance shall be within 5 ohm for installation capacity upto 5 KW and one ohm for installation of higher capacity.

16.0 The completed work will be taken over only if the results obtained in above tests are within

the limits mentioned above, and in accordance with I.E. Rules.

On completion of the installation work, a certificate shall be furnished by the contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in a prescribed form as required by the local Electric Supply Authority. The installation shall not be considered as complete unless the installation is got inspected and passed by the Directorate of Electrical Safety, of the local State Govt/Authority. The contractor shall have to take all initiatives and follow up the matter at his own cost for early approval of the installation for permanent energisation of the installation from the Directorate of Electrical Safety, of the local State Govt/Authority. No extra amount will be paid on this account. However statutory fees, if

any, will be reimbursed to the contractor on production of documentary evidences/official money receipts.

17.0 SPECIAL SPECIFICATIONS

a) Before fixing all switches, fittings etc. these should be produced before Engineer-in-Charge and get approved.

b) All metal switch boards and switch/regulator boxes to be used in work shall be painted with two coats of anti rust primer (red oxide paint) prior to erection. After erection these shall be again painted with two coats of enamel paint of approved quality and shade.

c) Before execution of any portion of conduit work for wiring a neat proper layout should be made out by the contractor and got approved from the Engineer-in-Charge. For this purpose contractor is advised to get acquainted with the layout drawings of the Consultant/Interior Decoration Contractor.

d) While laying the conduits for concealed wiring in the ceilings/beams/columns/walls/ partitions/modular furniture etc, the contractor must ensure that all the inlets and both ends of the conduits are plugged to stop entry of foreign materials so that no difficulty arises during drawing of wires later .

e) Damage to any fitting during erection and before handing over the installation by contractor shall be set right or replaced by the contractor at his own cost.

f) Caution Board of proper size wherever required, shall be provided, as per I.E.E. regulations for which no extra payment will be admissible.

g) Any repairs done to wall etc. should match with the surrounding surface otherwise same will be got done through Building Contractor at the cost of the Electrical Contractor.

h) Earthing Installation shall be done in the presence of Engineer-in-Charge or his representative.

i) The installations should not be energized without adequate earthing.

j) Distribution Fuse Boards shall be provided with neat lettering in block letters with paint and for the points connected to each fuse way of the D.B's for which no extra payment will be admissible.

k) Completion Drawings

The contractor shall be required to submit along with Final bill, the undernoted drawings in the form CD, along with three copies of Ammonia print each.

1. Plan (as per structural drawing) of each floor (not less than l:l00 metric scale) showing :-

i) Location of Main Switch Board, Distribution boards (with the circuit numbers controlled by them).

ii) The runs of mains and submains.

iii) Location of lights, fans, wall sockets, other power consuming devices together with type of fittings and fixtures including circuit numbers.

iv) Position of Lightning Conductors and route of running conductor.

v) Position of Earthing Stations for light and power and Lightning Conductor Installation.

vi) Following information are to be given on all the drawings :

a) Name of work with job no. Accepted Tender No.

b) Date of completion

c) Name of Place

d) Name and Signature of Contractor

e) Scale of Drawings.

2 Schematic lines layout diagram of each floor showing (i) Layout and connections of Main and Sub-board, B.D.B. having descriptions of the size, capacity, type and their numbers, the system and the source of supply, (ii) Location, Size, Type, length of main and sub main cables (iii) Loading of each B.D.B. indication of phases, Departmental mark on each B.D.B and switchgear.

The drawings shall be very neatly drawn and submitted properly without folding them.

3. Cable route should be marked on site plan with measurements from permanent structures.

TECHNICAL SPECIFICATION FOR M.S. CONDUIT WIRING SYSTEM

1.0 TYPE AND SIZE OF CONDUIT

All conduit pipe shall be screwed type, solid drawn or welded and with black stove enamelled surface or galvanised and of thickness conforming to IS : 9537 Part II of 1981 (or latest revision) in all respects. The conduits are to be free from burrs and internal roughness. No conduits less than 20 mm in dia shall be used, unless specified.

2.0 ACCESSORIES

Only screwed type of accessories are to be used.

3.0 CONDUIT JOINTS

The conduit shall be properly earthed. In long distance straight runs of conduit inspection type screwed couplers are to be provided at reasonable intervals on running threads with couplers and jamnuts. Threads on conduit pipes in all cases shall be between 13 mm to 27 mm long sufficient to accommodate pipes to full threaded portion of couplers or accessories. Cut end of conduit pipes shall have no sharp edges or any burrs left to avoid damage to insulation of conductor while pulling them through such pipes.

4.0 PROTECTION AGAINST DAMPNESS AND RUST

In order to minimise condensation and sweating inside the tube, all outlets of pipes system shall be properly drained and ventilated, but in such a manner as to prevent entry to insects inside the conduit.

To protect against rust the outer surface of the conduit and accessories shall be painted

and the bare thread portion is to be painted with anti-corrosive preservative.

5.0 FIXING OF CONDUITS

Conduit pipes shall be fixed by heavy gauge saddles and h.w. or metal bars, secured to wall/ceiling by screws driven into wood plugs or rawl plugs or phil plugs at an interval of not more than 76 cm apart for vertical run and 60 cm apart for horizontal run. But on either side of couplers or bend of similar fittings-saddle shall be fixed at a distance of 30 cm from the centre of such fittings. The minimum thickness for saddles shall be 24 SWG for conduits upto 25 mm dia, and 20 SWG for larger sizes.

6.0 BENDS IN CONDUITS

All necessary bends in the system including diversion shall be done by bending the pipes, or by inserting suitable inspection type bends, elbows or similar fittings, or by fixing cast iron inspection boxes whichever is most suitable.

7.0 OUTLETS

All outlets for fittings, switches etc. shall be fixed on boxes of suitable metal for either surface mounting system or flush mounting system. In case of cast iron boxes the wall thickness shall be at least 3 mm and in case of welded mild steel sheet box the wall thickness shall not be less than 16 gauge. Except where otherwise stated 3 mm thick insulated laminated sheets shall be fixed on the front with screws. Where conduits are terminated special care shall be taken in employing double jam nuts, for securely fixing conduits to outlets so as to prevent any possibility of damages to cables when drawn.

8.0 CABLES TO BE USED

Unless stated otherwise only single core PVC insulated cables of approved manufactures shall be used for wiring in conduit system. The number of single core cables drawn in one conduit shall not be greater than maximum set out in Table II of Indian Standard (I.S. 732-1963) Code of Practice (revised) for electrical wiring installation(system voltage not exceeding 650 volts).

9.0 LOOPING IN SYSTEM

Distribution wiring in conduit to light, fan plug points etc. shall be done in looping system. In this system no joints or connections shall be made anywhere of the system except at terminating points such as at terminals of switches, ceiling roses, etc and in case of socket outlets at the socket terminals.

10.0 EARTHING CONTINUITY WIRES

All three pin 6 Amps plug points and metallic fan regulator cover should be provided with earthing attachment by NO. 14 SWG G.I. wires for surface wiring and 1 no. 1.5 Sq.mm PVC insulated copper wire for concealed wiring, unless specified otherwise.

Three pin 16 Amps power plug point should be provided with earthing attachment by No. 14 SWG G.I. wire for surface wiring and 1 no. 2.5 sq.mm PVC insulated copper wire for concealed wiring, unless specified otherwise.

Conduits and accessories for surface distribution wiring should be provided with earthing attachment by 14 SWG G.I. wire, unless specified otherwise.

For looping earthing G.I.wire shall be run on conduits being fixed with saddles. This wire shall not be normally visible after installation when run with the conduit. Where the wire has to be taken without the conduits this will be fixed with 'U' nails at 2' feet intervals.

TECHNICAL SPECIFICATION FOR NON METALLIC CONDUIT WIRING SYSTEM

1.0 SCOPE

This specification covers the detailed requirements for wiring work in non-metallic conduits. This specification covers both surface and recessed types of wiring work.

1.1 APPLICATION

1.1.1 Recessed conduit work is generally suitable for all applications. Surface conduit work may
be adopted in places like workshops etc and where recessed work may not be possible to be done. The type of work shall be as specified in individual works.

1.1.2 Flexible non-metallic conduits shall be used only at terminations, wherever specified.

1.1.3 Special Precautions

i) If the pipes are liable to mechanical damages, they should be adequately protected.

ii) Non-metallic conduit shall not be used for the following applications :

a) IN concealed/inaccessible places of combustible construction where ambient temperature exceeds 60 degrees C.

b) In places where ambient temperature is less than 5 degrees C.

c) For suspension of fluorescent fittings and other fixtures.

d) In areas exposed to sunlight.

1.2 MATERIALS

1.2.1 Conduits

i) All non-metallic conduit pipes and accessories shall be of suitable material complying with IS:2509-1973 and IS:3419-1989 for rigid conduits and IS:9537 (Part 5) 2000 for flexible conduits. The interior of the conduits shall be free from obstructions. The rigid conduit pipes shall be ISI marked.

ii) The conduits shall be circular in cross-section. The conduits shall be designated by their nominal outside diameter. The dimensional details of rigid non-metallic conduits are given in Table-II.

iii) No non-metallic conduit less than 20 mm in diameter shall be used.

iv) Wiring capacity

Maximum capacity of conduits for drawing in of PVC insulated cables shall be as follows :

650/1100V PVC copper wire	In 20 mm dia conduit	In 25 mm dia conduit	In 32 mm dia conduit
1.5 sq.mm	4 Nos	8 Nos	12 Nos
2.5 sq.mm	3 Nos	6 Nos	10 Nos
4.0 sq.mm	2 Nos	6 Nos	8 Nos
6.0 sq.mm	-	5 Nos	7 Nos
10.0 sq.mm	-	3 Nos	5 Nos

Maximum number of PVC insulated 650/1100V grade aluminium/copper conductor cable are as per CPWD General Specification of Electrical Works Part-I (Internal), Page 41, 1994.

1.2.2 Conduit Accessories

i) The conduit wiring system shall be complete in all respect including accessories.
ii) Rigid conduit accessories shall be normally of grip type.
iii) Flexible conduit accessories shall be of threaded type.
iv) Bends, couplers etc shall be solid type in recessed type of works, and may be solid or inspection type as required, in surface type of works.
v) Saddles for fixing conduits shall be heavy gauge non-metallic type with base.
vi) The minimum width and the thickness of the ordinary clips or girder clips shall be as per Table-III.
vii) For all sizes of conduit, the size of clamping rod shall be 4.5 mm (7 SWG) diameter.

TABLE-I

Maximum number of PVC insulated 650/1100V grade aluminium/copper conductor cable conforming to IS 694-1990

Nominal Cross Sectional Area of Conductor in sq.mm	20 mm S	20 mm B	25 mm S	25 mm B	32 mm S	32 mm B	38 mm S	38 mm B	51 mm S	51 mm B	64 mm S	64 mm B
1.50	5	4	10	8	18	12	-	-	-	-	-	-
2.50	5	3	8	6	12	10	-	-	-	-	-	-
4	3	2	6	5	10	8	-	-	-	-	-	-
6	2	-	5	4	8	7	-	-	-	-	-	-
10	2	-	4	3	6	5	8	6	-	-	-	-
16	-	-	2	2	3	3	6	5	10	7	12	8
25	-	-	-	-	3	2	5	3	8	6	9	7
35	-	-	-	-	-	-	3	2	6	5	8	6
50	-	-	-	-	-	-	-	-	5	3	6	5
70	-	-	-	-	-	-	-	-	4	3	5	4

Note : 1. The above tables shows the maximum capacity of conduits for a simultaneous drawing in of cables.
2. The columns headed 'S' apply to runs of conduits which have distance not exceeding 4.25 m between draw in boxes and which do not deflect from the straight by an angle of more than 15 degrees. The columns headed 'B' apply to runs of conduit which deflect from the straight by an angle of more than 15 degrees.
3. Conduit sizes are the nominal external diameters.

TABLE-II

Dimensional details of rigid non-metallic conduits
(All dimensions in mm)

S.No.	Nominal outside diameter (in mm)	Maximum outside diameter (in mm)	Minimum inside diameter (in mm)	Maximum

permissible
eccentricity
(in mm)
Maximum
permissible
ovality
(in mm)
1 20 20 +0.3 17.2 0.2 0.5
2 25 25 +0.3 21.6 0.2 0.5
3 32 32 +0.3 28.2 0.2 0.5
4 40 40 +0.3 35.8 0.2 0.5
5 50 50 +0.3 45.0 0.4 0.6

TABLE-III

Ordinary clips or girder clips

Size of Conduit Width Thickness
1) 20 mm & 25 mm 19 mm 20 SWG (0.9144 mm)
2) 32 mm & above 25 mm 18 SWG (1.219 mm)

2.0 FISH WIRE

18 S.W.G. G.I. wire shall be used and it shall protrude the conduit ends by 9 inches.

3.0 CONDUCTOR BOXES, DRAW-IN-BOXES : JUNCTION BOXES :

These shall be constructed from 16 SWG M.S. sheet and have M.S. cover. Minimum size for connector boxes is 6" x 4" and for Draw-in-Boxes 4" x 4".

4.0 PAINTING

Outside of wall switch boards, connector boxes & draw-in-boxes and other C.I./M.S. accessories shall be painted with two coats of anti-rust paint in addition to other painting instruction given elsewhere.

TECHNICAL SPECIFICATION FOR CABLE INSTALLATIONS

1.0 GENERAL

All Medium Voltage and Low Voltage PVC insulated and armoured/unarmoured cables shall conform to IS 1554 Part-I-1964 and of 1,100 volt grade.

Old and used cables must not be used for installation. Only one make of cable shall be used. All cables brought to site must be tested and got approved by the Engineer-in-Charge before these can be laid. The cables shall be despatched to site on wooden drums with ends sealed. Exact lengths shall be determined by the Contractor after measurement at site.

The underground installation of cables shall be generally conforming to I.S. 1255-1967, Code of Practice for installation and maintenance of underground cables (upto including 33 KV).

2.0 LAYING OF CABLES

a) Inside Building

Cables shall be laid on walls/ceiling/structure, unless specified otherwise, with M.S. brackets and suitable clamps or over claw type aluminium cleats fixed on M.S. brackets, spaced not more than 450 mm apart. G.I Bolts of suitable sizes are to be grouted on the wall properly for fixing the brackets.

b) Minimum bending radius permissible is 12D for MV Cables and 20D for HV cables. At joints and terminations, the individual core of multicore cables should never be bent so that the radius is less than 15 times the diameter over the insulation.

No cable jointing is allowed between two terminal points.

3.0 CABLE JOINTING

All cable joints shall be carried out by experienced and Licenced jointers under strict supervision. Electro plated brass cable glands, aluminium/tinned copper cable sockets and approved jointing materials must be used. The price for cable jointing and finishing the ends of the cable shall include all materials and shall also provide for tools and plants for the work. The cable armouring is to be properly terminated. All cable accessories and other associated materials shall conform to Indian Standard Specification where applicable. Proper earthing of cable glands and armouring shall be included in the job.

4.0 TESTING OF CABLES

All cables shall be tested for insulation resistance with megger - 5,000V constant pressure megger insulation tester for HT Cables and 1,000 V constant pressure megger for MV Cables, before installation.

After installation and end termination, the cables shall be again subjected to the above test. Insulation value for HT Cables shall not be less than 100 megohms and for MV Cables 1.0 megohm.

After laying and jointing, the HV Cables shall be subjected to high voltage pressure test before commissioning, the test voltage being as specified in I.S.1255-1967 or latest.

Technical Specification 74

5.0 TESTING OF INSTALLATION

Before the completed installation is put into service or handed over to Owner, the installation is to be subjected to the above tests to the satisfaction of the Engineer-in-Charge. The completed work will be taken over only if the results are acceptable to the Owner/Architects/Consultant.

Technical Specification 75

TECHNICAL SPECIFICATION FOR EARTHING INSTALLATION

The installation shall generally conform to IS 3043 - Indian Standard Code of Practice for Earthing, as amended upto date.

1.0 EARTHING

2.0

a) Plate Electrode

Where plate electrode for earthing is to be employed, the size of the plate shall not be less than 0.6 m x 0.6 m x 6 mm thickness for G.I plate and 0.6 m x 0.6 m x 3mm thickness in case of copper plate.

The plate shall be buried vertically with the top at a minimum of 4.0 M below the ground level for sandy soil and 2.0 M below the ground level for normal soil. In order to place the same at the prescribed depth, the dimension of pit to be excavated shall be 0.9 m x 0.9 m x 3 M deep. The plate shall be placed in position by the contractor only after the inspection of excavated pit and approval is obtained from the Engineer. One no. 50 mm x 6 mm G.I flat (for electrical installation) or one no. 25 mm x 6 mm GI flat (for Lighting conductor) should be connected to the plate at two points by means of 65 mm long 12 mm dia galv bolts, nuts and galv washers. In case of copper plate copper flat of not less than 32 mm x 6.0 mm shall be used as the earth lead. Brass bolts, nuts and washers shall be used for fixing. All other details shall be in accordance with IS 3043-1987. No joint on the earth lead conductor is permitted. Every care be taken to ensure that the ends of the wire/flats have been securely clamped by the bolt on cleaned surface of the plate and established a good electrical contact.

After placing the plate the earth lead conductor shall be protected by means of a continuous length of G.I pipe (Class-B) having 50 mm dia bore or depending upon the size of the lead, right from the plate upto a height of 0.60 metre (2 ft) above ground level. The whole length of pipe shall be filled with bituminous compound of approved make and brand. The molten compound shall be poured from the top end the pipe and topped upto overflowing.
The plate electrode shall have a 50 mm galvanized iron water pipe buried vertically and adjacent to the electrode and reaching upto the center of the plate. The upper end of the pipe shall be atleast 5 cm above the bottom of the inspection pit and with wire mesh, funnel, etc as per IS specification.

2.0 MASONRY INSPECTION PIT

The inspection pit for the earth station shall be approx 0.56 M x 0.56 M (1'-10"x1'-10") outside dimensions and approx 0.45 M (l'-6") deep when completed, having 5" thick cement brick work with lst class bricks in cement mortar (6:l) both inside and outside plastered 19 mm (3/4") thick and neatly cemented l.60 mm (l/16") thick, both inside, outside and top. The opening on top shall be provided with a C.I. ring with lockable cover fixed flush with ground surface.
All the excavations shall be duly back filled, dressed and rammed.

3.0 LOCATION FOR EARTH ELECTRODES

Electrodes shall be buried at least 2 M (6'-6") away from the building pole or object to be earthed. However, earthing electrodes for L.C. installations should be as close to the down conductors as possible.
Electrodes, when installed in parallel, shall not be placed less than 2 M (6'-6") apart and preferably placed at distances greater than twice their lengths.

4.0 EARTH BUSBAR

a) Galvanised M.S. Flat

The busbar shall be of suitable size and length, as specified in the Schedule of Items, heavily galvanised and having adequate number of drilled and tapped holes 30 mm apart, complete with G.I. bolts, nuts, washers for securely connecting the earth leads and earth continuity conductors. The busbar shall be fixed on wall, having clearance of 6 mm from wall with spacing insulators with at least 13 mm (l/2") G.I. rag bolts spaced about 0.46 M (l'-6") apart.

b) Copper Flats :

To be used, as specified, in the Schedule of Items, where earthing requirements are more stringent. Brass bolts, nuts washers shall be used for connections.

5.0 VALUE OF EARTH RESISTANCE

In case of installations where the load does not exceed 5 K.W. the resistance to earth shall on no account exceed 5 ohms. Where the load exceeds 5 K.W. the resistance shall not exceed l ohm.
For sub-stations, the value is l ohm.
For L.C. installations, the value is l ohm.