

Technical Specifications

FOR EARTHING

1. A 300 mm x 300 mm x 300 mm (inside dimension) concrete box (wall thickness min. 50 mm) with smooth cement plaster finish shall be provided on the top of pit. A concrete lid of 25 to 50 mm thick, with pulling hooks, painted black shall be provided to cover the earth pit. PVC sleeve of appropriate size shall be provided in concrete wall to take out earthing connections.
2. The masonry work shall be white washed inside and outside.
3. Care shall be taken regarding level of the floor surrounding the earth so that the connector is not too deep in the masonry or projecting out of it.
4. **On backside of the cover, date of test and average resistance value shall also be written with yellow/white paint on black background with date.**
5. The earthing shall be carried out as per IS 3043-1966 or revised. The earthing should be complete in all respect like connection, inter-connection etc.
6. Two separate and distant earth connection shall be provided for all metal parts, structures and equipments.
7. The earthing strip/wire laid in ground shall be buried 500 mm deep.
8. The buried earth strips/wire shall be applied with one bitumen coat. The earth connection strips of the main earth buried under ground shall be covered with dry sand 50 mm around.
9. Pipe electrode shall be provided and their dimension shall confirm to drawings as per the relevant IS.
10. No. of earth electrode shall be so decided that combined earth resistance of earth bus shall not exceed more than 2 ohms for plate electrodes.
11. The distance between 2 earth electrodes shall not be less than twice the length of electrodes.
12. The size of the earthing conductor from earthing pit to the other end shall be of 8 SWG GI wire.
13. Pipe electrode shall be provided and their dimension shall conform to RDSO drawings no. ET/OHE/P/7020-MOD-B or latest & Plate electrode shall conform to drawing No. Sr.DEE/G/BPL/64/2002/113 or latest.

FOR CABLING

whenever and wherever clamps & glands (brass cable glands) are required then they shall be shaped to accommodate the 'cable' and should be painted with two coats of red oxide and two coats of paint matching with general decor / surrounding surface.

A Cable laying in trench:

This involves Excavation of 1000 mm deep trench in soil/hard murrum/tar road/below Railway track then the bottom of the trench should be leveled, freed from stones / sharp edges of rocks. Then lay a bed of 75mm thick fine sand at bottom of the trench. After this the cable shall be laid and then both sides are to be covered with 'B' grade bricks, thereafter sand to be filled on the cable by 75mm thick layer followed with final covering top side by 'B' grade bricks. The rest of the trench to be refilled by sheaved earth.

B Cable laying in trench in rock :

This involves Excavation of 750mm deep trench in rock. Then the bottom of the trench should be leveled, freed from sharp edges of rocks. Then lay a bed of 75mm thick fine sand at bottom of the trench. After this the cable shall be laid and then both sides are to be covered with 'B' grade bricks, thereafter sand to be filled on the cable by 75mm thick layer followed with final covering top side by 'B' grade bricks. The rest of the trench to be refilled by sheaved earth.

C Cable laying in loop form in each end:

This involves laying of cable in trench at the end of trench on sand bed of 75 mm and covering by sand and bricks; all as provided in case of cable laying in trench.

D Supply of 150mm dia. RCC pipe with collar and laying after excavation of 1000mm deep trench.

Erection involves excavation of 1000mm deep trench in soil/hard murrum/tar road/below Railway track. Then the bottom of the trench should be leveled, freed from stones / sharp edges of rocks. Then lay RCC pipe at the bottom of the trench.

E Cable laying inside 150mm dia. RCC pipe on road/track crossing and reforming original surface of the road/track.

This involves laying of cable in the RCC pipe already laid. Then filling of trench by sheaved earth. Then reforming of surface of this trench to match with the original surrounding surface.

F Erection involves the Cable laying on wall/pole, fixing using MS flat [25x6mm.] clamps, nuts, bolts, screws or nails as per site requirement etc.

G Supply of pipe, as per schedule, ISI marked pipe for cable support on wall/pole/road.

H Erection involves fixing of the pipe on wall/pole with MS flat [25x6 mm.] clamps, fixtures, bushing, nuts, bolts, grommet on each end of pipe & supply of these materials (MS flat [25x6 mm.] clamps, fixtures, bushing, nuts, bolts, Gromet etc.)

I Supply portion under this item shall mean that cost of glands (brass cable glands), termination. Erection involves connecting, commissioning of cable with nuts, bolts, on both end of cables & supply of these materials nuts, bolts etc.)

J Cable route marker: Supply & providing cable route markers marked with 'L.T./H.T.cable' as required at every turning points/road crossings and at 20 Mtrs. distance. Erection involves foundation of cement concrete with 1:3:6

FOR WIRING

Scope: Technical data covers the general technical requirements of the various components in internal electrical installation works and wiring / rewiring system

- 1) This system shall be done in PVC casing and capping (wire ways). The casing shall have a square or rectangular body. The capping shall slide-in-type with double grooving. All surfaces shall have smooth finish inside and outside.
- 2) PVC casing and capping shall be of good quality PVC free from defects like deformation, unevenness, blisters, cavities, ivory colour, only to be clamped supported, fixed at every 400 mm distance. Precision/Presto Plast / Modi/ V-Plast MAKE casing, capping is to be used.
- 3) The sizes of casing and capping for the various sizes of wires and maximum number of 1100 V grade PVC insulated, stranded copper conductor cables conforming to IS-694-1990 or latest, that can be carried in one casing and capping are as under:

Nominal cross sectional area of conductor in sq.mm	10/15 mm x 10 mm	20 mm x 10 mm	25 mm x 10 mm	30 mm x 10 mm	40 mm x 20 mm	50 mm x 20 mm
1.5	3	5	6	8	12	18
2.5	2	4	5	6	9	15
4.0	2	3	4	5	8	12
6.0	--	2	3	4	6	9
10	--	1	2	3	5	8

- 4) The thickness of the casing and capping shall be approx. 1.2 mm +/- 0.1 mm. The casing shall be fixed by means of suitable head screws to approved type of asbestos or fibre fixing plugs at intervals not exceeding 40 cms for all sizes. On either side of the joints, the distance of the fixing arrangement shall not exceed 15 cms. from the joint. Screw head shall be counter sunk within the center of the casing. Alternatively, round headed screws may be used. The wire-ways in straight runs should be in single pieces so as to avoid joints. Joints in capping shall not overlap therein casing. Joints arising out of bends shall be done using standard accessories like elbows, tees, 3 way/ 4 way junction etc. casing to harmonies with decor.
- (II) 1) Conductors of wiring wires shall be of PVC insulated, multi stranded copper conductors (Colour code of RYB may be used for 3 phase wiring) of following sizes:
From switch board to light point:
- (a) For light/fan/5A plug/call bell point wiring, from switch board: 1.5 sq.mm (point wiring)
 - (b) From SDB to switch board for light/fan/5A plug circuit wiring: 2.5 sqmm (sub-main wiring)
 - c) From SDB to separate 5A switch board : 2.5 sqmm
 - d) From SDB to separate 15A socket point wiring : 4.0 sq.mm
 - e) From SDB to 20A metal clad socket separate circuit (AC): 4.0 sq.mm
 - d) For Sub-mains (Meter to SDB) : 6.0 sq.mm

2) Flexible cables/wires: Conductors of flexible wires shall be of copper of size 32/0.2 mm.

(III) **Wiring accessories:**

(1) Control switches (single pole switches) carrying current capacity 6A for Light & Fan, shall be Piano type and the switch shall be 'ON' when the knob is down. Combined switch-cum-socket shall not be permitted. The power (15A/16A) outlet shall be controlled by MCBs. Control switch shall be placed only in the live conductor of the circuit.

2) **Socket outlet:** Socket outlet shall be of Piano type as also their control switches. These shall be rated either for 5A/6A or 15A/16A. Combined 5A/15A or 6A/16A circuits only where specified. Sockets for the power outlets of rating above 1 KW shall be of Industrial type with associated plug top and controlling MCB. Outlet box for socket outlets (both for 15A/16A and 5A/6A) points in residential buildings shall be of size 175 mm x 100 mm. Unless and otherwise specified, the control switches for the 5A/6A and 15A/16A socket outlets shall be kept along with the socket outlets.

(IV) Ceiling rose: Only the flexible cord shall be connected to a ceiling rose to fan, FT fitting etc.

(V) Lamp holders: Lamp holders shall be type as required. The holder shall be rigid with sufficient threading for fixing.

(VI) Conformity to IE Act, IE Rules and tenders: All electrical works shall be carried out in accordance with the provision of Indian Electricity Act 1910 or latest and Indian Electricity Rules 1956 or latest, or amended up to date. The work shall also conform to relevant Indian Standard Codes of Practice (COP).

(VII) **General requirement of components:**

- All components in various installations shall be of appropriate ratings of voltage, current and frequency.
- All conductors, switches and accessories shall be of such size as to be capable of carrying the maximum current which will normally flow through them without their respective ratings being exceeded.
- All components shall conform to relevant Indian Standard Specification. Similar parts, say all switches, lamp holders, distributors, fuse boards, switchgear, ceiling roses, brackets, pendants, fans and all other fittings of the same type shall be interchangeable in each installation.

(VIII) Passing through walls or floors: When wiring cables are to pass through a wall, these shall be taken through a protection (steel/PVC) pipe or casing/capping with ends neatly bushed.

(IX) **Joints in wiring:** No bare conductor in phase and/or neutral or twisted joints in phase neutral and/or protection conductors in wiring shall be permitted. No joints shall be in the through runs of cables. Termination of multi-stranded conductors shall be using suitable crimping type thimbles.

(X) **Rating of outlets:**

Ceiling fans, exhaust fans, all light lamps and fittings etc. shall be rated according to their capacity. 5A/6A & 15/16A socket point shall be rated at 100W and 1000W

respectively.

(XI) **Capacity of circuits:**

- 1) Lighting circuit shall not have more than a total of 6 Nos light/ fan and socket outlets.
- 2) Power circuits shall be designed with only one outlet per circuits. The circuit shall be designed based on the load where not specified. These loads shall be taken as 1 kW per outlet.
- 3) Load more than 1 KW shall be controlled by an isolator or miniature circuit breaker (MCB).

(XII) **System of distribution:**

- Main Distribution Board shall be controlled by circuit breaker or linked switch with fuse. Each outgoing circuit shall be controlled by a switch with fuse/circuit breaker.
- Branch Distribution Board shall be controlled by a linked switch fuse or a circuit breaker. Each outgoing circuit shall be provided with a fuse/ a circuit breaker on the phase of live conductor. The earthed neutral conductors shall be connected to a common link and be capable of being disconnected individually for testing purpose. The DB shall be fixed on suitable support/ fixture or walls and shall be accessible for replacement of MCBs / Fuses. The DBs shall be weather proof type, if exposed to weather or damp situation.

(XIII) **Exhaust fan:**

Exhaust fans shall be erected at the place indicated by Engineer-in-charge, for fixing an exhaust fan, a circular hole shall be provided in the wall to suit the size of the frame, which shall be fixed by means of rag bolts embedded in the wall. The hole shall be neatly plastered to the original finishing of the wall. The exhaust fan shall be connected to exhaust fan point. Wiring of exhaust fan point should be done using 1.5 sq.mm copper wire.

(XIV) **Earth continuity:**

- A protective (earth continuity) conductor shall be drawn inside the casing & capping for earthing of all metallic boxes of the installation as well as for connection to the earth pin of the outlets. The earth continuity wire shall be PVC insulated copper conductor wire suitable as per size of main wire confirming to relevant IS and IE rule.
- Location for earth electrodes: Normally an earth electrode shall not be located closer than 1.5 M from any building. The earthing arrangement shall be done as per drawing of 3043-1966 or revised.

(XV) Wiring plan should be got approved by Electrical engineer prior to start of the work.

(XVI) The control board shall be of PVC/modular.

(XVII) The maximum number of wires to be run inside the metal/ MMS PVC conduit pipe shall be as under:

S.No.	Size of wire	16 mm (1.2mm thick)	19 / 20 mm (1.5 mm thick)	25 mm (2 mm Thick)	40 mm (2 mm thick)	32 mm (2 mm thick)
1.	1.5 sq.mm	2 nos.	5 nos.	8 nos.	--	12 nos.
2.	4.0 sq.mm	2 nos.	3 nos.	7 nos.	--	10 nos.
3.	6.0 sq.mm	--	2 nos.	5 nos.	--	08 nos.
4.	10 sq.mm	--	--	3 nos.	6 nos.	04 nos.

(XVIII) **Concealed conduit wiring system:**

This system of wiring shall comply with all the requirement described above under ‘surface Conduit System’ and in addition, confirm to the requirements described under:

The conduit shall be fixed in position by means of M.S. hooks not more than 60 cm. apart by making a chase in the wall. The conduit shall be fixed so that its top is 6mm below the surface of wall. The chase shall be of ample dimension to permit the conduit to be fixed properly and shall be made neatly in the wall. The chase shall be filled up neatly after erection of conduit.

The outlet boxes shall be same as for surface conduit system and shall be mounted flush with the wall/ceiling.

WIRING IN P.V.C. CONDUITS: The P.V.C. conduits shall be of approved make and brand, I.S.I. marked of medium duty minimum 1.6 mm thick. The couplers, inspection boxes long neck, solid bends shall also be of heavy duty P.V.C.

The system of wiring shall comply with all the requirement described above in rigid steel conduit system and in addition confirm to the requirement described here under.

The earth continuity wire of 2.5 sq mm, shall be PVC insulated in Green colour copper wire and shall be carried inside the conduit of suitable size.

FOR LT PANEL LIKE MDB / SDB

Scope: The specification covers the design, manufacture, supply, connecting, testing and commissioning of LT panel.

1.0 The LT panel shall be suitable for the following systems:

- a) Rated voltage ; 433 Volt, 3 PHASE, 4 wire
- b) Rate frequency : 50 cycles

2.0 Site conditions:

- a) Ambient temperature : 45° C maximum
: 05° C minimum
- b) Humidity : 80% maximum
(Maximum temperature & humidity are not likely to occur simultaneously)

3.0 Standards

The design, manufacturing and testing of various equipments covered by this specification shall comply with the latest issue of the following standards.

- a) IS-4237: General requirement for switchgear and control gear for voltage not exceeding 1000V.
- b) IS-4047: Specification for Heavy Duty Air break switches and composite units of Air break switches and fuses for voltage not exceeding 1000 volts.
- c) IS-2208: Specification for HRC cartridge fuse-links up to 650 volts.
- d) IS – 2705: Specification for current transformer.
- e) IS-1248: specification for electrical indicating instruments.
- f) IS-2516: Specification for alternating current circuit breaker.
- g) IS-2147: Degree of protection provided by enclosures for low voltage switchgear and control gear.

4.0 **Constructional features:**

- 4.1 LT panel shall be sheet steel cubicle, indoor, floor mounting, and dead front free standing type. The design shall be totally enclosed, completely dust tight and vermin proof. The sheet steel used shall be 2.0 mm thick, gaskets shall be used between all adjacent units and beneath all covers to render the joints effectively dust proof.
- 4.2 Sheet steel work shall be of high quality. All opening and cut outs in the doors shall be free from burrs. Weld runs shall be ground smooth. All sheet surfaces shall be free from dents and hammer marks.
- 4.3 A base channel of 50 x 40 mm fabricated out of 3 mm thick hot rolled sheet steel, painted black shall be provided to prevent corrosion of the sheet steel cubicles and to facilitate cleaning of floors. For convenience of operation and ease of cable termination, there shall be a gap of at least 140 mm between the floor level and bottom most unit.
- 4.4 The design shall be based on modular construction. The LT panel shall be easily extensible and shall have a high degree of flexibility. The arrangement shall be logically compact and neat.
- 4.5 Barriers shall be provided between the modules accommodating equipment associated with outgoing circuits.
- 4.6 All vertical sections shall have a covering at the bottom so that entry of dust, rats, vermin is not possible.
- 4.7 The LT panel shall be of single front construction. The sheet used at the back of panel should be fixed using bolts and nuts i.e. it should be removable in outdoor type of

panel door + gaskets + sloped top etc. should be provided to give required protection.

- 4.8 LT panel shall be dead front type. All switches shall operate from the front. The rating of ACBs and fuse switches & all other shall be as specified in schedule. Outgoing feeders shall be neatly arranged in different compartments.
- 4.9 The maximum operating height shall not exceed 2000 mm.
- 4.10 The frame work shall be made of steel sheets, folded to impart strength, which will also serve as continuous barriers between logically arranged switchboard components. The entire arrangement of horizontal and vertical bus bars unit compartments and cable space shall be modular. The frame work shall house schedule items **MCCBs / MCBs, with HRC fuses**, indicating lamps R.Y.B. Ammeter and volt meter with selector switch, Bus bars, cable alloy, CT, ammeter, voltmeter with selector switch, etc with individual doors. All doors shall be held securely against sponge rubber gaskets to make the equipment dust tight. All hinged doors shall be provided with insulated thumb screws. Adequate lifting facilities shall be provided for each shipping section to facilitate handling and transport. It shall be possible to choose compartment sizes easily and arrange them in desired fashion at design stage. The compartment sizes shall be integral multiples of one basic size.
- 4.11 Each circuit shall be comprised of ACB/ MCCB/MCB etc as specified.
- 4.12 The compartment doors shall be so interlocked that it shall not be possible to open the door with the switch in closed position. An arrangement for defeating this door interlock shall be provided if asked for.
- 4.13 Outgoing links from feeders shall be rigidly supported and suitably extended in cable box chamber for case of cable connections. Cable lugs and links shall be covered by insulating shield.
- 4.14 Equipment offered shall be capable of withstanding the rigorous industrial environment and resisting rough handling during transport. The design, arrangement and finish shall be elegant and workmanship shall be of high order.
- 4.15 Normally, equipment for individual feeders shall be accommodated in separate module.

5.0 **Switchgear details of the board:** As per schedule.

- 6.0 Bus bar rating: 1000A/500A/200A or as per design requirement for the LT panel/MDB/SDB etc. considering the ratings of switchgears & total rating of all ACB/ MCCB/**TPN**/MCB etc. provided and taken further.
- 6.1 Three phase and neutral **copper / Aluminium** bus bars shall be provided.
- 6.2 Bus bars shall be housed in separate bus bar chambers. Horizontal bus bars shall be extended throughout the length of panels. The bus bars shall be suitably traced to withstand the fault level. The bus bars shall be supported on unbreakable, non-hygroscopic hylam supports rigidly held to the frame work of the chamber.
- 6.3 Bus bar chamber shall have a separate screwed cover and means shall be provided to identify the various phase of the bus bars.
- 6.4 Cable runs shall not prevent or obstruct the access to the bus bars. The connectors between horizontal and vertical bus bars shall be short and neat.
- 6.5 Connections between vertical bus bars and **MCCB / MCB** terminals shall be preferably fully enclosed so as to leave no exposed live parts and shall present neat appearance. It shall be possible to work on the **MCCB / MCB** outgoing connections without any danger of accidental contact with live connections between the bus bars and **MCCB / MCB**.
- 6.6 The outgoing terminals of the breaker shall be brought to the rear cable chamber by means of suitable supported links for easy access and connection of cables.

7.0 **Cable space**

- 7.1 Ample cable space designed to accommodate cables shall be essential feature of the design.
- 7.2 The access for cabling shall be from the back of the switch board.
- 7.3 LT panel shall be designed to facilitate **cables** entry from top and bottom as the case may be. Removable sheet steel plates shall be fitted at the top and bottom for cable entry at site.

8.0 **PAINTING**

All steel work shall undergo a process of degreasing, pickling in acid, cold rinsing. Phosphatising, passivating and then be sprayed with a high corrosion resistant primer. The primer shall be baked in an oven. The finishing treatment shall be application of two coats of synthetic enamel or power coating of approved shade followed by stoving.

- 10.0 **FUSES** – Fuses shall be HRC type (rewireable fuses are not acceptable) breaking capacity corresponding to the short circuit fault level obtained on the system. They shall be provided with visible indicators to show that they have operated. It shall be possible to remove the fuses using an insulated fuse pulling handle without the help of any other tool.

11.0 **WIRING**

- 11.1 LT panel shall be completely factory wired, ready for connecting to the equipment.
- 11.2 Power connection of the circuits shall be done by **copperflats** of adequate sizes or PVC insulated **copper / Aluminium wires**. Control wiring shall be done by PVC insulated wires of minimum size 1.5 sq mm **copper**. All control wiring shall be fitted with identification ferrule at each end. Not more than two connections shall be made at any one terminal. The wires shall be arranged and supported in such a manner that there shall be no strain on terminations.
- 11.3 The terminals shall be of adequate current rating and size to suit individual feeder requirement. Power terminals shall be pressure clamp type suitable for **copper / Aluminium** wires. The cable lugs shall be mounted in such a manner so as to facilitate cable connection. Terminals shall be jointed in the cable compartment behind feeder compartments and all power wire shall be terminated at these for connection to the purchaser's cables.
- 11.4 Tapping connections at the bus bar shall be pressure clamp type or made with nuts, bolts and washers. But bars shall not be tapped for terminating wire connections.

12.0 **METERING**

Incoming feeder panel shall be provided Digital meter to measure voltage, current, frequency, power factor and energy unit.

13.0 **INDICATING LAMPS:**

Indicating lamps for 3 phases, R, Y, B for indicating whether the bus bars are live or not, should be provided.

- 14.0 **CABLES:** Engraved PVC cables shall be provided on all the incoming and outgoing feeder compartments. The exact legend to be engraved will be furnished with the order.

- 15.0 **MCBs:** C' series- for light fan inductive load and all power circuits.

SPECIFICATION FOR CHEMICAL EARTHING

Specification for advanced earthing compound

- Earth-pit backfill material should be Highly conductive.
- It should be Capable of reducing soil resistivity by upto 90%
- It should be Non- corrosive and hence improving the life of the earthing system. It should not damage the electrode metal in any way.
- It should not depend on ambient moisture to sustain the earth resistance values. Thus should perform in all weather conditions giving stable earth resistance values.
- It should be Compatible with all types of earthing electrodes, be it pipes, plates or rods of any metal..
- It should be such that it Increase the total surface area of the earthing electrode ensuring quick dissipation of fault currents.
- It should Maintain constant volume regardless of moisture content. Therefore doesn't shrink or expand. it should maintain constant contact with electrode and surrounding soil.
- It should have Long shelf life; could be stored for very long periods without deterioration.
- It should be Environmental friendly; and should not pollute or contaminate the water table.

Specification for advanced earthing electrodes

Advanced earthing electrodes should endure the most enviously corrosive environments. They should be robust enough to withstand fault currents of very high magnitude. Should be fabricated from excellent quality G.I/Copper pipes.

The pipes should be profiled with proprietary "super conductive crystalline compound" which encloses the primary conductor completely, increasing it's surface area and also forming a protective layer against corrosion.

Features :

- It should be of robust design to Last for a lifetime.
- It should have three level protection from Corrosion
- Outer Pipe should be of GI/Copper
- It should have Layer of super conductive crystalline compound
- Primary conductor should be of Pipe/Strip

Supply & erection of stay set of 20mm complete with all accessories for pole/pole structure.

Supply portion under this item shall include supply of complete stay duly painted with two coats of red oxide paint and two coats of bituminous paint for the length to be embedded in ground & plinth and two coats aluminum paint for the remaining portion, straining screw, loop insulator, GI stay wire 8 SWG, angle iron bracket of 50x50x6mm with clamps of MS flat of size 50x6mm.

The erection under this item includes excavation of pit for foundation, making of foundation with cement concrete mixture at angle as per drawing; the assembly of all the supplied parts suitably using required of fasteners to form the complete stay set. The cost of cement concreting for pole is covered under relevant item of the schedule.

Specification for Exhaust Fan:

Supply, installation, testing, commissioning of 380 mm sweep or of size as mentioned in schedule all Metal body construction industrial type heavy duty exhaust fan, propeller type, single phase, 1400 RPM complete with all standard accessories including civil works of opening in the wall and finishing the same after work, with minimum warranty of one year or more as per the manufacturer as per approved list.

Supply and fixing of 25/32mm dia. Heavy duty PVC conduit pipe with suitable clamps, fixtures, nuts & bolts etc.

This includes supply, laying, fixing, testing and commissioning of PVC conduit 25/32mm dia. conforming to IS 9537 or latest along with necessary accessories for wiring. These conduits along with required accessories are to be laid before casting the slab and vertical runs on wall (from the slab/ceiling to the control boards, electrical points etc.) This includes necessary repairs of masonry works happened to execute at the time of the above work. Finishing of wall & other affected area shall be done by contractor at his own cost matching to surrounding surface.

Supply, fixing, testing & commissioning of 2.5 sq.mm single core copper conductor for main/sub main wiring

This item includes supply of single core 2.5 Sq mm copper wire along with proper connectors for termination of the wire. Then the wire should be laid inside the already erected casing /capping/ conduit pipe etc. of all kind wiring for connection of electrical switchgear /equipments as per standard wiring practice in groups as per the site requirement.

Supply, fixing, testing & commissioning of 4.0 sq.mm single core copper conductor for main/sub main wiring

This item includes supply of single core 4 Sq mm copper wire along with proper connectors for termination of the wire. Then the wire should be laid inside the already erected casing /capping/ conduit pipe etc. of all kind wiring for connection of electrical switchgear /equipments as per standard wiring practice in groups as per the site requirement.

Supply, fixing, testing & commissioning of 6.0 sq.mm single core copper conductor (From MDB/VDB/SDB/Switch board to Switch Boards)

This item includes supply of single core 6.0 Sq mm copper wire along with proper connectors for termination of the wire. Then the wire should be laid inside the already erected casing /capping/ conduit pipe etc. of all kind wiring for connection of electrical switchgear /equipments as per standard wiring practice in groups as per the site requirement.

Supply, fixing, testing & commissioning of 10.0 sq.mm single core copper conductor for main/sub main wiring or COP wiring.

This item includes supply of single core 10.0 Sq mm copper wire along with proper connectors for termination of the wire. Then the wire should be laid inside the already erected casing /capping/ conduit pipe etc. of all kind wiring for connection of electrical switchgear /equipments as per standard wiring practice in groups as per the site requirement.

Excavation of trench in all types of soil & making nitch in rocky area for 500 mm wide 1000/1200 mm deep

This item covers excavation of trench in all types of soil hard/soft of 500 mm wide and 1000/1200 mm deep from the ground level as per instruction given by Railway Engineer considering the site condition and back filling the same after laying of GI/DWC pipe and cable, then ramming the soil. This also covers making of nitch of 200 mm depth in rocky area after laying of GI pipe, it should be back cover with sand & cement after laying of GI pipe, the area shall also be repaired to its original position.

If the digging of 1000/200 mm is not possible then it may be varied only as acceptable to Railways, after considering the site condition. The payment shall be made in proportion of the depth of excavation compared to 1000mm/200 mm depth. Railway decision in this regard is final & binding on the Contractor.

Supply, fixing testing & commissioning of modular ceiling fan regulator.

Supply, fixing, testing and commissioning of Modular type fan regulator. The regulator shall be fixed in the already provided combined light & fan modular switch board, the design & colour of regulator shall be as per the adjacent switches and modular board. Prior approval of modular type ceiling fan regulator is to be taken from competent authority.

Supply, fixing testing & commissioning of MS fan boxes with hook arrangement for fixing of ceiling fan.

This include supply, laying, fixing, testing and commissioning of MS Fan boxes suitable for wiring minimum 125mm dia/65mm deep or of any other size as required as per site condition and directed by Railway Engineer with hook as per relevant standard specification and painted with red oxide for Concealed wiring. The MS fan box shall be fixed in roof or other places as per standard practice before casting duly consulting civil engineering department. The MS fan box etc. shall be got approved from Railway Engineer before fixing.

Supply, fabrication and laying of MS flat of size 45 mm x 8 mm at 0.5 Mtrs. below the ground and its connection between earth points & other equipment.

The price shall cover supply and installation per meter length of 45x5mm MS flat, buried at a depth of 0.5 meter below ground level or as directed by site engineer. The price shall also cover connections of the steel flats to the earth electrodes to constitute the main earth ring and to the earthed terminals of various equipment's as required. The MS flat should be properly connected to earth grid by welding.

Supply and laying of heavy duty HDPE Pipe for provision of Cables in pipe.

The items covers supply of HDPE pipe of size as mentioned in the tender schedule of reputed manufacturer confirming to Railway specification. The contractor shall have to submit manufacture test certificate and should be as per latest Railway specification with anti-rodent, antioxidant and non-flammable properties. It also includes the supply of all required material for joining the pipes.

The work also includes the laying of pipe in the trench with a gradient to facilitate drainage of water and should be at right angle to the track. It also includes the supply of all material & their erection for making smooth joints and water tight for the pipe.

Laying, connecting, testing and commissioning of Cable in HDPE pipe

This item involves the laying of cable inside the HDPE pipe with proper care to avoid damage to the cable.

Specification for 5 star BLDC ceiling Fan:

S. NO.	SPECIFICATION	OBSERVATION
1	Type	BLDC
2	BEE Star rating	5 Star
3	Sweep size	1400 MM
4	Air delivery	270 CMM (minimum)
5	RPM	280 RPM (minimum)
6	Max input wattage	35 watt (maximum)
7	Winding material	Copper
8	Blade material	Aluminum
9	Blade thickness	1.1 mm (with paint) minimum
10	Type of bearing	double wall bearing
11	Remote	No
12	With regulator	No.
13	Service Value	7.7 Minimum
14	ISI marked	Yes
15	Warranty	5 year
16	NABL accredited LAB test report	Yes
17	Compatibility of Regulator	Yes (Any branded regulator should be Compatible)

Specification for Exhaust Fan:

Supply, installation, testing, commissioning of 380 mm sweep or of size as mentioned in schedule all Metal body construction industrial type heavy duty exhaust fan, propeller type, single phase, 1400 RPM complete with all standard accessories including civil works of opening in the wall and finishing the same after work, with minimum warranty of one year or more as per the manufacturer as per approved list.

Supply and fixing of 25/32mm dia. Heavy duty (MMS) PVC conduit pipe with suitable clamps, fixtures, nuts & bolts etc.

This includes supply, laying, fixing, testing and commissioning of PVC conduit 25/32mm dia. conforming to IS 9537 or latest along with necessary accessories for wiring. These conduits along with required accessories are to be laid before casting the slab and vertical runs on wall (from the slab/ceiling to the control boards, electrical points etc.) This includes necessary repairs of masonry works happened to execute at the time of the above work. Finishing of wall & other affected area shall be done by contractor at his own cost matching to surrounding surface.

Supply, installation, connecting, testing and commissioning of RSJ pole of 9 mts. long as Rail pole complete with muffing & foundation with transportation from site

This involves supply of 9 mtrs. Long RSJ pole of 175 X85mm of 19.6 Kg/mtr, the price includes the transportation charges up to the site. The poles shall be drilled for fixing of fittings as per site condition. It includes the excavation of pit in the earth for approx. 1/6 meters the length of the pole and making of foundation with cement concrete. The poles shall be painted by two coats of red oxide and two coats of bituminous paint for the length embedded in ground/plinth, then two coats of aluminum paints after erection at the site. It also includes the earth coil which shall be used while concreting work for foundation of pole and connection of earth wire of 8 SWG G I Wire with the earth coil and the same shall be connected to the pole. The erection of pole shall be done to suit the termination of ACSR conductors or AB cable for overhead power line. The cost of concreting is covered under other item of the schedule

Supply, erection, installation, connecting, testing and commissioning of 50 Sqmm ACSR conductor.

This include supply, erection, installation, connecting, testing and commissioning of 50 Sqmm ACSR conductor of reputed make and standard quality.

Supply & fixing of 32 mm PVC casing & capping.

This item includes the supply of PVC casing capping of 32mm size as per site requirement of approved make and the same should be fixed on the wall/ ceiling with proper clamping arrangement as per standard Rlys wiring

SPECIFICATION FOR 5M OCTAGONAL POLE

Supply and erection of Octagonal galvanized steel pole of 5mtrs. Long on cement concrete foundation complete with foundation bolts & other accessories. The pole should be hot dipped galvanized, at internal & external surface by single dipping method in accordance with IS2629 or equivalent up to 65 micron DFT and should have one longitudinal weld and should be in one section designed for a basic wind speed of 180 KMPH with mounting single bracket type as per following specifications:

Top Diameter - 70 mm

Bottom Diameter –130mm

Thickness - 3 mm

Base plate – 200 x200x 12 mm

Foundation bolt size - 16 dia 600 mm long (4 Nos.) on 200 PCD

Foundation size -500 X 500 X 1000 mm

Pole should be with mounting single arm type, junction box fitted internal for cable and light connection, steel confirming to S-335JO, box plate IS-2062, foundation bolt, confirming to IS-1367part –III. Foundation should be casted of RCC (M-15), 20 cms above the ground level. One number PVC pipe of suitable diameter should be provided in foundation for cable entry. All material sand, cement, ballast, foundation bolts etc. will be supplied by the contractor. The pole shall be standard reputed firms only.

SPECIFICATION FOR 6M POLE

Supply and erection of galvanized steel pole of 6 mtrs. Long on cement concrete foundation complete with foundation bolts & other accessories. The pole should be hot dipped galvanized, at internal & external surface by single dipping method in accordance with IS2629 or equivalent up to 65 micron DFT and should have one longitudinal weld and should be in one section designed for a basic wind speed of 180 KMPH with mounting single bracket type as per following specifications:

Top Diameter - 70 mm

Bottom Diameter –130-135mm

Thickness - 3 mm

Base plate – 220 x220x 12 mm

Foundation bolt size - 16 dia 600 mm long (4 Nos.) on 200 PCD

Foundation size -500 X 500 X 1000 mm

Pole should be with mounting single arm type, junction box fitted internal for cable and lightconnection, steel confirming to S-335JO, box plate IS-2062, foundation bolt, confirming to IS-1367part –III. Foundation should be casted of RCC (M-15), 20 cms above the ground level. Onenumber PVC pipe of suitable diameter should be provided in foundation for cable entry.All material sand, cement, ballast, foundation bolts etc. will be supplied by the contractor. The poleshall be standard reputed firms only.

Supply and erection of H beam of 152X152 mm of (37.1Kg/mtr) & 13mtrs. Long along with earth coil. This involves supply of 13 mtrs. Long H beam pole of 152 X152 mm of 37.1 Kg/mtr, the price includes the transportation charges up to the site. The poles shall be drilled for fixing of fittings as per site condition. It includes the excavation of pit in the earth for approx. 1/6 portion of the length of the pole and making of foundation with cement concrete. The poles shall be painted by two coats of red oxide and two coats of bituminous paint for the length embedded in ground/plinth, then two coats of aluminium paints after erection at the site. It also includes the earth coil which shall be used while concreting work for foundation of pole and connection of earth wire of 8SWG G I Wire with the earth coil and the same shall be connected to the pole. The erection of pole shall be done to suit the termination of ACSR conductors of over head power line/AB Cable on one side & cable termination on the other side. The cost of cement concreting for pole is covered under relevant item of the schedule.

Supply & erection of fencing panel

The prices shall include supply and erection of fencing panels as per relevant RDSO drawing, painted with two coats of red oxide zinc chromate primer and finished with two coats of aluminum paint to IS:2339. The prices shall not include supply and erection of fencing uprights, anti-climbing devices but shall include the cost of fasteners and the price shall be for a meter length of the panels, measured in the plan view of the approved drawings. The price shall cover supply and erection of gates including locking device. The gates will be painted with two coats of red oxide zinc chromate primer to IS:2074 and finished with two coats of aluminum paint price shall be per meter length of the gate as measured on the plan view of the appropriate approved drawings.

Transformer- Erection, Connecting, testing & installation of 33/0.433 KV, 500 KVA transformer on new RCC foundation of ratio 1:2:4 and 1.5 Mtr X 1.25 Mtr X 1.75 Mtr (LBH) suitable for 500 KVA transformer. The foundation drawing has to be approved by the Railway. The contractor has to arrange cranes and all other tools etc. for loading/unloading of transformer. All connection have to be done by new ACSR DOG conductor suitably covered with proper RYB Sleeves.

Erection under this item includes provision and connection from incoming and outgoing sides of these equipments and erection of transformer on suitable foundation using requisite copper jumpers, clamps, nuts, bolts of size appropriate for the purpose, whose supply is included in erection (Foundation shall match with the existing foundations / shall be made as directed by Engineer.) It also includes connecting, testing and commissioning of connections from D.O. fuses to HT bushings of transformers with copper conductors of equivalent sizes sleeved PVC and connection through P.G. clamp as per technical data. The foundation details shall be as per IS & design for the foundation shall be approved from the Rlys. before excavation/erection of the foundations. Also, sufficient length of the transformer foundation should be made under/below the ground as approved by railway. Erection also includes the necessary tests as prescribed by Railway Engineer or manufacturer & submission of test reports.

The price shall cover shifting, erection of dismantled transformer at another location by erection, testing and commissioning of transformer complete with terminal connectors as per RDSO specification No. ETI/PSI/15 (8/2003) or latest version on the foundation. It shall also cover supply and erection of retro reflective number plate of Rly. approved design. The price shall also cover supply of EHV grade insulating oil as per relevant RDSO specification for top up. The work also includes the oil filtration and pre-commissioning tests as approved by the Railways. The contractor shall make his own arrangement for oil filtration equipments as well as power supply required for the same. All necessary tools, equipments, instruments

required to carry out oil filtration/checks/tests/commissioning shall be arranged by the contractor. The price shall also include the transportation of transformer at required site by his own arrangements.

Cement concrete for all works in sub-structure & super structures including all type of shuttering/centering etc. complete for foundation plinth, pole foundation etc.

The price shall cover excavation, supply and handling of all materials and accessories, temporary arrangements for excavation in all type of soil. Shoring where necessary, casting concrete including frame work where necessary, tamping of concrete, grouting of pole and finishing the top of concrete foundation or anchor blocks. The price also include dismantling of all connected temporary arrangements, back filling with earth and compacting the same to the required height and width to ensure safety of foundation, confining the exposed height of foundation block and removal of spoil. Nominal reinforcement will be necessary proper ramming in black cotton soil foundations. The steel for nominal reinforcement will be arranged by the Contractor and the concrete mixture, in such a case shall be as per ISS 456 with latest amendment. The price shall inclusive of filling of concrete cubes at each 50 cubic meter of foundation & shall be tested from recognized laboratory at contractor cost. The items like foundation for various equipments as per approved drawing prepared by contractor, cable route marker, pole foundation etc. shall also be paid in this item.

Concrete for foundations shall be nominal mix of grade M10 obtained by mixing cement, coarse aggregate ,fine aggregate and water in accordance with proportions given vide table 3 of IS:456:1978 or latest. For muffing etc. foundation nominal mix concrete M.15 obtained mixing materials in proportions as indicated in table 3 of IS:456-1978 shall be used Volume batching may be adopted vide clause 9.2.2 IS:456-1978 or latest.

Pole foundation shall be of diameter 600mm and of depth 1/6 of the length of the pole to be erected. Cement concrete Muff of 400mm dia and 300mm height shall be provided around the pole on top of the foundation. At the bottom of the pit for foundation under cutting of depth 100mm., 800mm diameter shall be provided (included in total depth of foundation). Before erection of pole in this pit a bed of cement concrete of 100mm thickness shall be provided first. This includes necessary curing time. For erection of plinth for any equipment, the foundation details/Drgs. With RCC shall be made in detail & the same shall be got approved by the Railway Engineer before erection /excavation of the foundation. The top surface of the RCC plinth shall be levelled and finished properly for erection of the equipment.

TECHNICAL DATA FOR HIGH MAST

1. HIGH MAST STRUCTURE

a)	Height of Mast	:	16 mtr.
b)	Material construction	:	BS-EN 10 025, S 355
c)	Thickness in mm	:	Top 3 mm Bottom 4 mm
d)	Cross section of Mast in Polygon: (Number of sides)	:	20 sides (minimum)
e)	Length of individual sections :	:	Top 5.52 mtr(approx.) Bottom 10.98 mtr (approx.)
f)	Base and top diameter	:	Top diameter 150mm (min.) Bottom diameter 440 mm (min.)
g)	Type of joints	:	Stress fit side joints.
h)	Length of overlap	:	0.4 to 0.5 mtr.
i)	Metal protection treatment: for Mast erection	:	Hot dip galvanized through single dip process
j)	Thickness of galvanization	:	65 microns (min.) Top & bottom.
k)	Size of opening and door at base:	:	1200mm x 250 mm
l)	Type of locking arrangement and: door panel	:	Double internal
m)	Details of slack board inside the : base compartment	:	Resin bonded plywood (200 x 500 x8)mm
n)	Thickness of base plate	:	25 mm
o)	Diameter of base plate	:	670 mm
o)	Size of anchor plate & thicknes :	:	Uniform PCD of 590 mm
p)	Details of template	:	Uniform PCD of 590 mm
q)	Weight of Mast	:	700 kg (Approx)
r)	Lightening protection	:	GI single spike of length 1200mm.

2. DYNAMIC LOADING AS PREVAILING AT SITE

- a) Max. wind speed : As per IS 875 part-III, i.e. 180 Km/hr.
- b) Max. gust speed time : 3 seconds.
- c) Height above ground level these two factors (a) & (b) are measured. : 10 mtr.
- d) Factor of safety for wind load : 1:25
- e) Factor of safety for other load : 1:15 (1.0 as per TR NO-7)

3. FOUNDATION DETAILS:

- a) Type of foundation : Open raft shallow footing.
- b) Size of foundation : As per design.
- c) Designed load bearing capacity : 10 T per sq.m. at 2 m depth.
- d) Design safety factor : As per IS-456
- e) Considered wind pressure (Kg/sq.m) : As per IS –875 - 2015
- f) Considered wind speed (Km/Hr.) : As per IS –875 – 2015
- g) Depth of foundation : Minimum 1.5 mtrs below GL
- h) Average soil bearing capacity : As confirmed from the approved source
- i) Number of foundation bolts. : 8 nos (min.)
- j) PCD of foundation bolts : 590 mm
- k) Type of foundation bolts : High yield tensile cold Rolled pitched threads (680 N/sq.mm.)
- l) Bolt diameter : 25 mm (minimum)

4. LANTERN CARRIAGE:

- a) Material of construction : 50 NB ERW Class-B MS pipes
- b) Diameter of carriage ring (mm): 535 mm (ID) or as per design.
- c) Construction : Lantern Carriage with multiple decker
Horizontal circular type
- d) Number of joints : 2 nos.
- e) Buffer arrangement between carriage and mast : PVC sleeve on carriage
- f) Load carrying capacity : 500 Kg.
- g) Total weight of assembly with fittings. : As per no. of luminaries.
- h) Number of fittings : As per lighting design
- i) Type of fitting / fixture : LED (1 X 160W/150W with lamp) - 12 Nos.
- j) CA JB : Receptacle Cast Aluminum JB required for
distribution of wiring.

5. WINCH

- b) Number of drums / Winch : Double drum type
- c) Gear ratio : 53:1
- d) Capacity : 750 Kg.
- e) Operating speed : 180 rpm on full load
- f) Individual drum rotation : Easily possible.
- g) Method of operation : Manual / Electricals
- h) Lubrication arrangements : Permanent oil bath
- i) Type of lubricant : GARLEX C 11 / SAE 90
- j) Gear material : Cast iron.
- k) Tested load per drum : 750 Kgs per drum
1500 Kgs for winch
- l) SWL of winch at 200 rpm : 750 Kg. (min.)

6. STAINLESS STEEL WIRE ROPES

- a) Make : B W Ltd.
- b) Grade : AISI 316
- c) Number of ropes : 2 continuous ropes or 2/3 ropes
- d) Construction : 7 / 19
- e) center core materials : Stainless steel core
- f) Diameter : 6 mm
- g) Thimble & Talurit : SS thimble Copper Talurit.
- h) Braking load capacity : 2350 Kgs x 2
- i) Safety factor : > 5 system full load.

7. CABLE :

- a) Type : 5 core flexible PCP/ EPR
- b) Material : EPR insulated PCP sheathed
- c) Make : As per your specific design.
- d) Current carrying capacity : 24 Amps.
- e) Conductor size : 2.5 sq.mm.
- f) No. of cores : 5 nos (min.)
- g) No. of circuit : Two.
- h) Metallic M/F socket : 6 Pin
- i) Bobbin : PVC Bobbin with Chain

8. POWER TOOLS:

- a) Model : Internal
- b) Input supply : 3 phase, 415 Volts
- c) Wattage / HP : 1 HP
- d) Number of speed : Single speed
- e) Operating speed : 2 m/min at full load.
- f) Remote control switch : Push button type at 2 / 3 mtrs.
- g) Motor plate : Motor mounting plate required

9. TORQUE LIMITER:

- a) Lifting capacity : 750 Kg.
- b) Adjustable / Non- adjustable : Adjustable.
- c) Tripping device : Mechanical.

SPECIFICATIONS FOR HIGH MASTS:

1. Design:

The high mast tower shall be polygonal in cross section with sectional area continuously decreasing with height of the tower. The polygon shall be at least 20 sided to present a pleasing appearance. The structure shall be suitable for wind loading as per IS 875 part-3 of 2015.

The mast shall be fabricated from steel plates conforming to BS-EN 10-025 S355 or equivalent, cut and folded to form a polygonal section, telescopically jointed & welded. The welding shall be as per BS-5135. The mast shall be delivered in 2 sections. The mast sections shall have one longitudinal seam weld throughout. Mast sections with more than one longitudinal weld are not acceptable. The sections shall be jointed together at site by slip stressed fit method. The minimum overlap distance shall be 1.5 times the diameter at penetration. Design calculations of the mast must be submitted for verification.

The mast shall be provided with fully penetrated flange free from laminations or incursions. The welded sections of the base flange shall be fully developed to the entire section. The base flange shall be provided with supplementary gussets between the bolt holes to ensure elimination of helical stress concentration. The entire mast must be hot dip galvanized to protect it from environmental conditionings. The galvanization shall have a uniform thickness of at least 65 microns.

An adequate door opening shall be provided at the base of the mast which must be adequate to permit clear access to equipments like winches, cable, plug & socket etc. & for easy removal of the winch. The door opening shall be complete with a close fitting, vandal resistant, weather proof door provided with a heavy duty double internal lock with paddle key. The door opening shall be reinforced with welded steel section so that the base section of the mast is prevented from buckling at the linings of the cut out of the door.

2. Dynamic loading of the Mast:

The mast shall be designed to sustain a maximum wind load arising out of a wind speed as per IS 875-2015 and IS-847 (three second gust). The wind speed shall be measured at a height of 10 mtrs. above ground level. The mast shall have a designed life of 25 years.

3. Lantern Carriage :

The lantern carriage shall be designed to carry a minimum of 12 nos. 1 x 160 watts LED luminaries as per approved make with control gears & two nos. Neon aviation lights with perfect self balance. The lantern carriage shall be of steel tube construction with holes fully protected by grommets to act as a conduit for wires.

The lantern carriage shall be fabricated in two halves & shall be joined by bolted flanges with stainless steel bolts & plastic lock type stainless steel nuts to enable easy installation or removal from the mast. The inner lining of the carriage shall be provided with protective PVC arrangements so that no damage is caused to the surface of the mast during the raising & lowering operation of the carriage. The entire lantern carriage shall be hot dipped galvanized after fabrication. A cast aluminium junction box shall also be provided on the lantern carriage for termination of the incoming power supply & for interconnection of the luminaries & control gears.

4. Raising & Lowering Mechanism :

A specially designed head winch shall be fixed at the base of the mast with head frame assembly fixed at the top to enable lowering and raising of the lantern carriage for maintenance. The winch shall be self-sustained type without brake shoes springs or clutches. Each driving spindle of the winch shall be locked with gravity activated PAWLS when not in use. Drums shall be individually operable for fine adjustment of the carriage. The capacity, operating speed, safe working load & recommended lubrication of the winch shall be clearly mentioned (inscribed) on the winch. The minimum-working load of the winch shall be more than 750 Kgs. The winch must be self-lubricating type by means of an oil bath with oil of a readily available grade of reputed make.

The winch drum shall be grooved to ensure perfect seat for the rope with no chances of rope slippage. The rope termination in the winch shall be such that distortion & swings of the rope shall be eliminated with at least five turns of rope remaining on the winch even at the lowest position of the carriage. The winch shall have provision for manual operation by a suitable handle or by an integral power tool. A winch gearbox for simultaneous & reversible operation of the double drum shall be provided.

A test certificate furnishing the maximum load of operation of each winch issued by the original manufacturer shall be submitted by the tenderer with the completed tender form.

The head frame shall be designed as a capping unit of the mast having welded steel construction, galvanized both internally & externally after assembly. The top pulley shall have diameter large enough to accommodate the steel wire ropes & the multi core electric cable.

The pulley block is made of non-corrodible cast aluminium alloy (LM-6). Self-lubricating bearing & stainless steel shaft is provided to facilitate smooth & maintenance free operation for a long period. The pulley assembly shall be protected by a canopy of steel galvanized internally & externally. The head frame shall be provided with guides & sleeves to ensure that the ropes & cables do not get dislodged from their respective positions in the grooves. The head frame shall be provided with guides & stops with PVC buffer for ducking the lantern carriage.

The suspension system shall be without any intermediate joints & shall be made up of non-corrodible stainless steel of AISI 316 or better grade. The stainless steel ropes shall be of 7/19 construction. Both the cores shall have the same material. The overall diameter of the rope shall not be less than 6 mm. The breaking load of the rope shall not be less than 2350 Kgs. Individually, giving factor of safety over 5 for the system at full load. The end constructions of the ropes to the winch drum shall be fitted with talurit. The thimbles shall be secured on the ropes by compression splices. Both the lengths of the stainless steel wire ropes between the winch & lantern carriage shall have no intermediate joints bolted or otherwise.

5. Electrical Cable connections:

A suitable terminal box shall be provided at the base of the high mast for termination of the incoming cable for power supply. The electrical connection from the bottom to the top shall be made by special trailing cable. The cable shall be EPR- epoxy resin insulated & PCP sheathed to get flexibility and endurance. Size of the cable shall be minimum **5 core 2.5 sqmm copper** of reputed make. There shall be a weatherproof junction box at the top to terminate the trailing cable. Connection from the top junction box to the individual luminaries shall be made by using 3 core 1.5 sq mm flexible PVC cable of a reputed make. The trailing cables of the lantern carriage rings shall be terminated by means of specially designed, metal clad, multi-pin plug & socket provided in the base compartment to enable easy disconnection when required.

6. Power tool for winch:

Suitable, high-powered, electrically driven, internally mounted power tool complete with control devices shall be supplied for the raising and lowering of the lantern carriage for maintenance. The power tool shall be single speed with a motor of suitable rating for internal operation. The capacity and speed of the power tool shall be suitable for lifting combined load of lantern carriage with accessories and luminaries. The power tool shall be designed to be self supporting & shall be perfectly aligned with the winch spindle during raising & lowering operations. There shall be provision for manual operation in case of failure of the motor, a handle for this purpose shall be provided.

The power tool shall be provided with a torque limiter to trip the motor when the load to be lifted exceeds the adjustable limits. There shall be a provision for warning the operator once the load is tripped.

7. Lightening Finial :

One heavy duty hot dipped galvanized lightening finial shall be provided with each mast. The lightening finial shall be provided at the top of the head frame having a height of at least 1.2 Mtrs. The finial shall be firmly bolted to the head frame to provide a direct conducting path to the earth through the mast.

8. Neon Aviation Light :

Two nos. Neon aviation lights of reputed make shall be provided on each tower.

9. Earthing Terminal:

A suitable earthing terminal using 12 mm dia. Stainless steel shall be provided at location on the base of the mast for earthing of the tower. The earthing terminal shall be connected to the earth pit to be erected as described in schedule & explanatory notes.

10. FEEDER PILLAR:

Each High mast Tower shall be provided with a feeder pillar having 14 SWG thick CRCA sheet enclosure painted with two coats of red oxide primer & grey enamel paint of shade 631 of IS-5. The feeder pillar shall comprise of one 63 A TPN MCB as incoming and three nos 32 Amps S/P MCB as outgoing and control equipment for the motor. All the MCB's shall be having rated breaking capacities 10 KA should conform to IS: 8828 and should be ISI marked. The feeder pillar shall be mounted on a suitable foundation near the mast.

11. All High Mast without LED fitting to be inspected by RITES irrespective value.