

SECTION-8B

TECHNICAL SPECIFICATIONS

1. GENERAL

1.1 General

- 1.1.1** These Specifications contained herein shall be read in conjunction with other tender documents.
- 1.1.2** The Work shall be carried out in accordance with the approved drawings and designs as would be submitted by the contractor and approved by the Engineer duly signed and stamped or issued to the Contractor by the Engineer duly signed and stamped by him as the case may be. The Contractor shall not take cognisance of any drawings, designs, specifications, etc. not bearing Engineer's signature and stamp. Similarly, the Contractor shall not take cognisance of instructions given by any other Authority except the instructions given by the Engineer in writing.
- 1.1.3** The work shall be executed and measured as per metric units given in the Schedule of Quantities, drawings etc. (FPS units where indicated are for guidance only).
- 1.1.4** Absence of terms such as providing, supplying, laying, installing, fixing etc. in the descriptions does not even remotely suggest that the Contractor is absolved of such providing, supplying etc. unless an explicit stipulation is made in this contract.
- 1.1.5** The specifications have been divided into different sections / sub-heads for convenience only. They do not restrict any cross-references. The Contractor shall take into account inter-relations between various parts of works/trades. No claim shall be entertained on the basis of compartmental interpretations.
- 1.1.6** The classification of various items of works for purposes of measurements and payments shall be as per Bills of Quantities (BOQ). Except where distinguished by BOQ, the rates apply to all heights, depths, leads, lifts, sizes, shapes and locations. They also cater for all cuts and wastes.
- 1.1.7** Reference to the Standard Codes of Practice.

Section:8B Technical Specifications

1. The contractor shall make available at site all relevant Codes of practice as applicable.
2. Legend:

BS	British Standard
CPWD	Central Public Works Department
IRS	Indian Railway Standards
IS	Indian Standards

1.1.8 Other Publications: - DELETED

1.1.9 Contractor to Provide:

The Contractor shall provide and maintain at site throughout the period of works the following at his own cost and without extra charge, except for the items specified in the Bill of Quantities the cost being held to be included in the Contract Rates:

1. General works such as site clearance before and on completion of works.
2. All labour, materials, plant, equipment and temporary works, overhead charges as well as general liabilities, obligations, insurance and risks arising out of GCC, required completing and maintaining the works to the satisfaction of the Engineer.
3. Adequate lighting for night works, and also at other times whenever and wherever required by the Engineer.
4. Temporary fences, barricades, guards, lights and protective work necessary for protection of workmen, supervisors, engineers, General public and any other persons permitted access to the site. Contractor shall provide proper signages as directed.

All fences, barricade shall be painted with colour shades as specified by the Engineer. The barricading should be of adequate height to ensure visual obstruction of work from public view.

Section:8B Technical Specifications

5. All equipment, instruments, labour and materials required by the Engineer for satisfactory completion of works.
6. Design mixes and testing them as per relevant clauses of specifications giving proportion of ingredients, sources of aggregates and binder along with accompanying trial mixes. Test results to be submitted to the Engineer for his approval before adoption on works.
7. Cost of Preparation and compliance with provision of a quality assurance control program.
8. Cost of safe guarding the environment as per SCC.
9. Contractor has to provide Method statements i.e., detailed work procedure for all the works

1.1.10 Quality Assurance & Quality Control

1. The work shall conform to high standards of design and workmanship, shall be structurally sound and aesthetically pleasing. The Contractor shall conform to the Quality standards prescribed, which shall form the backbone for the Quality Assurance and Quality Control system.
2. At the site, the Contractor shall arrange the materials, their stacking/storage in as per the standards manner to ensure the quality. The Contractor shall provide all the necessary equipment and qualified manpower to test the quality of materials, assemblies etc., as directed by the Engineer. The tests shall be conducted at specified intervals and the results of tests properly documented. The cost of all such testing shall be included in the quoted rates and nothing extra shall be paid for in this regard. In addition, the Contractor shall keep appropriate tools and equipment for checking alignments, levels, slopes and evenness of the surfaces.
3. (a) The Engineer shall be free to carry out such tests as may be decided by him at his sole discretion, from time to time, in addition to those specified in this document as per provisions of General Conditions of Contract. The Contractor shall provide the samples and labour for collecting the samples. Nothing extra shall be payable to the Contractor for samples, or for the collection of the samples.

(b) The test shall be conducted at the Site laboratory that may (to) be established by the Contractor at his cost or at any other Standard Laboratory selected by the Engineer.

(c) The Contractor shall transport the samples to the laboratory for which nothing extra shall be payable. In the event of the Contractor failing to arrange transportation of the samples in proper time the Engineer shall have them transported and recover two times the actual cost from the Contractor's bills.

(d) All testing shall be performed in the presence of Engineer or his authorised representative. Testing may be witnessed by the Contractor or his authorised representative if permitted by the Test House. Whether witnessed by the Contractor or not, the test results shall be binding on the Contractor.

4. All materials which do not conform to these specifications shall be rejected. In the event of contractor not being able to arrange the material conforming to these specifications or in the event of failure of the contractor to get the sources approved within the agreed schedule submitted by contractor, the Engineer shall have the powers to cause the Contractors to purchase and use such materials from any particular source, as may, in the Engineer's opinion, be necessary for the proper execution of work.

1.1.11 Dimensions

1. Figured dimensions on drawings shall only be followed and drawings to a large scale shall take precedence over those to a smaller scale. Special dimensions or directions in the specifications shall supersede all others. All dimensions shall be checked on site prior to execution.
2. The size, measurements and other information concerning the existing site as shown on the drawings are believed to be correct, but the Contractor should verify them for himself and also examine the nature of the ground as no claim or allowance whatsoever will be entertained on account of any errors or omissions in the levels or the description of the ground levels or strata turning out different from what was expected or shown on the drawings.

1.1.12 Setting out of Works-DELETED**1.1.13 Materials****1. Source of Materials**

It shall be the responsibility of the contractor to procure all the materials required for construction and completion of the contract. The contractor shall indicate in writing the source of materials well in advance to the Engineer, after the award of the work and get it approved from the Engineer before commencing the work. If the material from any source is found to be unacceptable at any time, it shall be rejected by the Engineer.

2. Quality

All materials used in the works shall be of the best quality of their respective kinds as specified herein, obtained from sources and suppliers approved by the Engineer and shall comply strictly with the tests prescribed hereafter, or where tests are not laid down in the specifications, with the requirements of the latest issues of the relevant Indian & other Standards.

3. Sampling and Testing

All materials used in the works shall be subjected to inspection and test in addition to test certificates. Samples of all materials proposed to be employed in the permanent works shall be submitted to the Engineer at least 15 days in advance for approval before they are brought to the site.

Samples required for approval and testing must be supplied sufficiently in advance in required quantity and number to allow for testing and approval, due allowance being made for the fact that if the first samples are rejected further samples may be required. Delay to the works arising from the late submission of samples will not be acceptable as a reason for delay in completion of the works.

Materials shall be tested before leaving the manufacturer's premises, source. Materials shall also be tested at site and they may be rejected if not found suitable or in accordance with the specifications, notwithstanding the results of the tests at the manufacturer's works or elsewhere or test certificates or any approval given earlier.

The contractor will bear all expenses for sampling and testing, whether at the manufacturer's premises at source, at site or at any testing laboratory or institution as directed by the Engineer subject to the provisions of No extra payment shall be made on this account.

4. Dispatch of materials

Materials shall not be dispatched from the manufacturer's works to the site without written authority from the Engineer.

5. Test certificates

All manufacturer's certificates of test, proof sheets, etc showing that the materials have been tested in accordance with the requirement of these specifications and of the appropriate Indian Standards are to be supplied free of charge to the Engineer.

6. Rejection

Any materials that have not been found to conform to the specifications or otherwise not acceptable to the Engineer will be rejected forthwith and shall be removed from the site by the Contractor at his own cost within three days or as instructed by the Engineer.

1.1.14 Storing of Materials at site

All materials used in the works shall be stored on racks, supports, in bins, silos, go-downs, under cover etc. as appropriate to prevent deterioration or damage from any cause whatsoever to the entire satisfaction of the Engineer.

The storage of materials shall be in accordance with IS 4082 "Recommendation on stacking and storage of construction materials on site" and as per IS 7969 "Safety code for handling and storage of building materials".

The materials shall be stored in a proper manner at places at site approved by the Engineer. Should the place, where material is stored by the Contractor, be required by the Employer for any other purpose, the Contractor shall forthwith remove the material from that place at his own cost and clear the place for the use of the Employer within the time as communicated by the Engineer and at no extra cost to the Employer.

1.1.15 Water

1. Water from approved source:

Potable water only shall be used for the works. Contractor shall have his own source of water duly tested and approved by Engineer. The water shall be free from any deleterious matter in solution or in suspension and be obtained from an approved source. The quality of water shall conform to IS 456.

2. Storage:

The Contractor shall make his own arrangements for storing water, if necessary, in drums or tanks or cisterns, to the approval of the Engineer. Care shall be exercised to see that water is not contaminated in any way.

3. Testing:

Section:8B Technical Specifications

Before starting any concreting work and wherever the source of water changes, the water shall be tested for its chemical and other impurities to ascertain its suitability for use in concrete for approval of the Engineer. No water shall be used until tested and found satisfactory. Cost of all such Tests shall be borne by the contractor.

1.1.16 Workmanship

1. Any work not to the satisfaction of the Engineer or his representative will be rejected and the same shall be rectified, or removed and replaced with work of the required standard of workmanship at no extra cost.

1.1.17 Load Testing On Completed Structures -DELETED

1.2 STRUCTURAL WORK-DELETED

1.2.1 Supply of Monthly Progress Photographs and Album-DELETED

1.2.2 Supply of Monthly Progress Video CD's-DELETED

1.2.3 Survey Work-DELETED

1.2.4 Barricading

The work covers barricading for the work done along the Existing IR track, median and areas affecting road or rail traffic. Barricading for other areas like casting yard, batching plant, storage and other working area shall be done at own cost by the contractor. The detailed scope of work is:

- (i) Providing and installing the barricade of the design and type as shown in the typical sketch furnished as per the approved plan firmly to the ground and maintaining it during the progress of work.
- (ii) Providing adequate road and IR track safety devices. A tentative list given hereunder identifies minimum items, which may be required. However, actual numbers required shall be as per plan approved by the Engineer and clearance obtained from traffic department, Bangalore and concerned division of Railway officials. During execution of works, if any additional cost to this list is required then the contractor shall not be paid any extra cost.

Section:8B Technical Specifications

- (iii) Dismantling of barricade , other temporary installation from the site and cleaning the site shall be as per direction of Engineer upon completion and acceptance of work.

Tentative Road or IR track Safety Devices are mentioned below or any other safety devices as per site requirement

1. Supply of Red portable traffic cones of 750mm height with white reflective tape bands on 100mm width all around.
2. Hazard warning light flashes with rechargeable. Maintenance free battery & charging system.
3. Safety light island post with 11 nos. parallel reflective.
4. Red reflective arrow fitted on enabled mild steel board of 360 x 220mm size.
5. Traffic Triangular Tripod made of fluorescent cloth fitted on steel frame.
6. Retro-reflective tape (I) 50mm width.
7. Fluorescent Jackets with reflective tape all around.
8. Yellow reflective cat eyes of size 115 x 11 x 22 mm made of ABS material having 19 glass beads on each side.
9. Metal Tabular Delineator of 610mm height with reflective tapes.
10. Retro-reflective arrows diversion board 450 x 900mm with crystal clear protective transparent coat to avoid damage on 14-gauge Mild Steel sheet with and without pole.
11. Retro-reflective "Men at Work" triangular board of size 900mm with crystal protective transparent coat to avoid damage on 14-gauge Mild Steel board with and without poles.
12. Retro-reflective board for "Go Slow Work in Progress" of size 1200 x 750mm with crystal clear protective transparent coat to avoid damage to the Mild Steel board with and without pole.
13. Retro-reflective advance direction signs cum Diversion Boards of size 1200 x 900mm with crystal clear protective transparent coat to avoid damage to the 14 gauge Mild Steel sheet with and without pole.
14. Retro-reflective speed limit circular sign Boards of 600mm Diameter with crystal clear protective transparent coat to avoid damage on 14 gauge sheet (without pole).
15. 'SORRY FOR INCONVENIENCE' Retro-reflective Boards of size 900 x 300mm size with crystal clear protective transparent coat to avoid damage on 14 gauge Mild Steel sheet (without pole).
16. HAZARD MARKERS (Yellow & Black) must be put all over the construction sites. This Retro-reflective board is of size 300 x 900mm with crystal clear protective coat to avoid damage and the 14 gauge Mild Steel with or without pole.

Section:8B Technical Specifications

17. 'CAUTION' tape which is normally yellow tape of special Polyether Material having 75mm width 'CAUTION' is written all over with Black colour is rolls of 300 meter.
18. For running trains ,Retro-reflective speed limit as per IR Specifications.

1.2.4.1 Measurement-DELETED

1.2.5 Transplantation of Trees -DELETED

1.2.5.1 Measurement-DELETED

Sub-Contractor-DELETED

1.3 Guarantees and Maintenance: - DELETED

1.3.1 Responsibility for Shop drawings, Samples and Mock-ups: - DELETED

1.3.2 Cleaning - DELETED

1.3.3 Expansion bolts/ fasteners: -DELETED

1.4 Applicable Codes, Standards & Publications for Electrical works

The important Codes, Standards and Publications to Contract are listed here under but not limited to:

Sl.no	Standard	Description
1	IS:3427	AC metal enclosed switchgear and control gear for rated voltages above 1 KV and up to and including 52 KV.
2	IS 12063	Classification of degrees of protection provided by enclosures of electrical equipment
3	IS 9920 (Parts 1 to 4):	High Voltage Switches.
4	IS 9921 (Parts 1 to 5):	Specification for AC disconnectors and earthing switches for voltages above 1000 V
5	IS 13118	HV AC Circuit Breakers

Section:8B Technical Specifications

Sl.no	Standard	Description
6	IS 12729	General requirements of switchgear and control gear for voltages exceeding 1000 V
7	IS 10601	Dimensions of terminals of HV Switchgear and Control gear.
8	IEC 1330	High voltage/Low voltage prefabricated substations
9	IEC 60694	Common clauses for MV switchgear standards.
10	IEC 6081	Monitoring and control.
11	IS 2705	Current Transformers
12	IS 3156	Voltage transformers
13	IS 8686	Specification for Static Protective Relays
14	IEC 62271-200	Standards for high voltage metal clad switchgear up to 52 KV.
15	IS 8130	Conductors for insulated electrical cables and flexible cords.
16	IS 10810(series)	Methods of tests for cables.
17	IS 10418	Drums for electric cables.
18	IS 7098 (Part 2)	Cross-linked Polyethylene insulation for Cables
19	IS 5831	Specification for PVC insulation sheath for electric cables
20	IS 7098 (Part-II) 13573,1992	Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1,2$ kV) up to 30 kV ($U_m = 36$ kV) - ALL PARTS
21	IS 3043	Code of Practice for Earthing
22	IS 398-part II	Aluminium Conductor for Overhead Transmission Purpose
23	IEC-99-4	Gapless Lightning Arrestor
24	IS 3070 P-III	Metal Oxide Surge Arrestors without gaps for AC Systems
25	IEC 99 P-III	Artificial Pollution Testing of Lightning Arrestor
26	IS 2071	Methods of H V Testing
27	IS 694	PVC Insulated cables for working voltages up to and including 1000V
28	IS 14786/2000	Specification for high voltage pre-fabricated Sub-station
29	IS 1180	Power Transformer
30	IS 3637	Gas Operated relays
31	IS 1347	Low Voltage Switchgear and Control gear

Section:8B Technical Specifications

Sl.no	Standard	Description
32	IS 1255	Code of practice for installation and maintenance of power cables up to and including 33 kv rating
33	IS 13158	Prestressed concrete circular spun poles for overhead power, traction and telecommunication lines -- specification
34	IS 785	Reinforced concrete poles for overhead power and telecommunication lines - specification
35	IS 4091	Code of practice for design and construction of foundations for transmission line, tower and poles

K-RIDE

TECHNICAL SPECIFICATION

1. POINT WIRING:

Wire of size 2x1.5 sq. mm (Phase & Neutral) & 1x1.5 sq.mm (Earth Wire), 1100 V grade FRLS (Fire Retardant Low Smoke) PVC insulated, multistranded copper wire in PVC concealed conduit and approved color with necessary junction boxes, angle holder etc. as required with relevant IS spec (IS 694: and latest amendments) with/without a 6A modular type SP control switch (Switch shall be paid separately) which shall be fixed on existing plastic sheet / gang box, the other end of the wire shall be terminated with sufficient loose length in a wood / PVC block.

2. GI Modular Switch Boxes:

Boxes for housing modular wiring accessories (switches, switched socket outlets, RJ 45 outlets, bell pushes, electronic fan regulators etc.,) shall be fabricated from minimum 1.6 mm thick MS sheets provided with rust inhibiting zinc phosphating treatment. The MS boxes shall be suitable for a grid plate fixed over it for mounting wiring accessories leaving ample space at the back and on the sides for accommodating wiring conductors, MS boxes shall be provided with a brass earth terminal. The MS boxes shall have knockout holes for conduit entry which shall be secured in position by check nuts and provided with bushes. No timber shall be used for any supports.

3. Modular PVC switch plate:

Switches, receptacles and telephone system outlet in wall shall be provided with moulded cover plates of shape, size and colour approved by the Engineer -in- charge made from high impact resistant, flame retarding and ultra-violet stabilized engineering plastic, and secured to the box with counter sunk round head chromium plated brass screws. Where two or more switches are installed together, they shall be provided with common switch cover plate as described above with notches to accommodate all switches either in one, two and three rows.

One and two gang switch cover plate, telephone outlet cover plate, 6/16A sockets with switch plates, shall have the same shape and size. Wherever five switches, seven switches, ten switches and eleven switches are to be fixed the next higher size of gang switch cover plate to be used and opening shall be provided with blank off covers at no extra cost.

4. SWITCH 6A:

Flush type switch - 6 A to operate on AC single phase 240V, 50 Hz supply confirming to IS 3854/latest.

Switches controlling fans and plug points shall have engraved letters 'F' and 'P' respectively as applicable/available for the category.

5. PLUG POINT 6A:

Wiring shall be with FR PVC insulated, multistranded copper of size 2.5 sq.mm for phase and neutral and 1.5 sq.mm for earthing with IS spec (IS 694 latest) with 6A modular switch and modular sockets mounted on GI box concealed on wall.

6. PLUG POINT 16A:

The plug point shall be 5 pin, 16A rated. A modular switch of 16A (IS 1293) shall be provided with plug socket. This shall be fixed on GI box. The plug point shall be by means of 2 runs of 4 sq.mm FRLS PVC

Section:8B Technical Specifications

insulated, multi stranded copper wire, 1100 V grade relavent IS spec (IS 694 latest) and 1 run of 1.5 sq.mm FRLS PVC insulated, multi stranded copper wire, 1100 V grade relavent IS spec (IS 694 latest).

7. CEILING FAN POINT:

The ceiling fan point wiring will be done with FRLS PVC insulated, PVC sheathed multi stranded copper wire of size, 2 runs of 1.5 sq. mm for Phase and Neutral and 1 run of 1.5 sq.mm for Earth, 1100V grade with IS Spec (IS 694) with fan junction box. A modular switch of 6A capacity shall be provided on switch board.

8. CEILING ROSE:

Surface semi recessed types for pendent lighting and fan, wherever require, to be used in circuits with voltage not exceeding 240V, current 5A, conforming to IS 371/latest.

9. DB MAINS 6 SQ. MM & 10 SQ.MM :

Wiring which is not covered under point wiring such as connection from Main Distribution Board to other Sub distribution board will be measured and recorded as DB mains. The DB mains shall be by means of Four nos of 6 /10 sq.mm FRLS PVC insulated, multi stranded copper wire, 1100 V grade relavent IS spec (IS 694 latest) and 1 run of 2.5 sq.mm FRLS PVC insulated, multi stranded copper wire, 1100 V grade relavent IS spec (IS 694 latest) in respective colours . All the DB main shall run suitable separate PVC conduit and earth connectivity shall be maintained.

10. PVC PIPE:

10.1 TYPE & SIZE OF PVC PIPES:

Heavy gauge PVC conduit pipe of of size 32mm dia, 2.5mm thick confirming to IS 2509 with suitable size bends, metal/ PVC junction boxes etc., All PVC pipes for wiring shall be confirming to IS 2509 with grey/ ivory colour.

Heavy gauge PVC conduit pipe of of size 25mm dia, 2.0mm thick confirming to IS 2509 with suitable size bends, metal/ PVC junction boxes etc., All PVC pipes for wiring shall be confirming to IS 2509 with grey/ ivory colour.

Heavy gauge PVC conduit pipe of of size 20mm dia, 2.0mm thick confirming to IS 2509 with suitable size bends, metal/ PVC junction boxes etc., All PVC pipes for wiring shall be confirming to IS 2509 with grey/ ivory colour

The number of insulated conductors that can be drawn into PVC pipes should be as per table III of IS:732/1963 and should be easy to pull at the time of rewiring. Conduit inspection type coupler at reasonable interval shall be provided. Scope includes supply of couplers, joint box, bends etc. at contractor's cost. No PVC pipe less than 20mm +/- 0.2mm in diameter with wall thickness of 2mm shall be used.

10.2 FIXING / CONCEALING OF CONDUIT:

Conduits shall be laid inside roof slab or wall for concealed wiring. Replastering shall be done after laying the conduits in the wall / roof. Conduits shall be attached with existing PVC pipe if already laid in roof.

11. SYSTEM OF WIRING:

Concealed or surface wiring system shall be adopted for wiring as per site condition as instructed by Engineer In Charge.

The system of wiring shall be such that separate phase and neutral wires shall be taken from the switch control board to each and every light/ fan point. Suitable Bakelite connectors shall be used in the switch control board for termination of phase and neutral wires controlling the light points. No jointing or twisting of wires is permitted either inside the control boards or anywhere else outside. Necessary earth continuity connection to fan/ light / socket points shall be provided along with wiring cable. Connection to light/fan from ceiling rose shall be with 3 core 1.5 sq.mm flexible copper cables with approved coloured sleeve. The wiring shall be carried out in an approved manner satisfying the relevant IS specification, code of practice available and additional specifications applicable if any for surface/ concealed wiring system.

The route of the wiring is to be decided in consultation with the authorised representative of Engineer-in charge. Chipping/ replastering of wall/ceiling as required for wiring shall be carried out by the contractor.

Before commissioning the installations, the following tests shall be conducted and the results shall conform to the values specified and shall be certified by the person whose competency certificate has been attached.

1. Insulation resistance test
2. Testing of polarity of non-linked single pole switches
3. Earth continuity path (Bell tester)
4. Earth resistance value
5. Any other test as desired by Engineer-in-charge on safety point of view.

Modular type switches/ sockets/ceiling roses/unbreakable boxes for switch boards etc shall be used for carrying out the wiring. Switch boards and MCB DBs shall be fixed in concealed/surface manner as per instruction of Engineer in charge. Blanking plates shall be provided for modular switch boards wherever necessary and this is in contractors scope of work at their cost.

Modular unbreakable boxes of various sizes shall be used for switch board as required. White finish cover frames shall be generally used with white switches and other accessories. Acceptance shall be obtained for the switches/boards etc. including colour selection before using at site. Modular boxes shall be inclusive of cover frame and inner plate.

12. 4 FEET 1x10/20W LED LIGHT BATTEN FITTING:

Fitting shall be of complete set with driver circuit, LED lamp etc. complying with CEE/SWR specification. (CEE/SWR specification No. SWR/LED Light fitting (Indoor/Outdoor)/001-2016 Dt. 18.04.016) given at para No.16

LED 10/20W fittings on the wall shall be mounted on suitable PVC round blocks - 2 Nos fixed as per standard wiring practice.

13. CEILING FAN:

The contractor should supply, assemble the ceiling fan, fix, and commission at the required location, with fixing of regulator. Fan should be connected to terminated wiring point (Ceiling Rose) by 1.5 Sq.mm Copper 3 core round flexible sheathed wire wherever necessary. This work includes fixing 1200 mm sweep BLDC ceiling fan with suitable electronic regulator, fixing fan hooks in ceiling with all necessary accessories.

Section:8B Technical Specifications

Description: Energy Efficient brush less DC Motor (BLDC) Ceiling Fan		
Technical Specification:		
1.	Sweep	1200mm
2.	BEE rating	5star
3.	Rated power	28 Watts
4.	Operating Voltage	230V Single Phase AC
5.	Frequency	50 Hz
6.	Air Delivery	220M ³ /min
7.	Harmonic Distortion	5% Max
8.	Speed Control	Smart remote control with Minimum three steps
9.	Blade thickness	1.1MM
10.	Blade material	Aluminium
11.	Bearing	Double Ball Bearing
12.	Down Rod Size (without Shackles)	300mm
13.	Shank and Shackle Thickness	2mm (Minimum)
14.	Canopy	2 Nos
15.	Colour	Standard White
16.	Warranty	5 Years
17.	IS Specification	1. The performance test for air delivery shall be conducted as per clause 10.3 of IS Specification No: 394 / 1979. 2. The fan shall comply with IS: 616 / 2010 for safety requirements for electronics equipment's.
18.	Test Report	The firm has to submit type test report from Govt. accredited test labs like NABL/CPRI etc.,

14. WARRANTY FOR BLDC FANS

Successful tenderer has to submit warranty certificate against failure for the BLDC fan(1200mm) for a period of 5 years from the date of passing of Final Completion Certificate for the work. In precedence to the same, the tenderer should submit a copy of an original undertaking on Stamp Paper of value Rs 200/-citing abidance to the 5 year warranty obligation duly signed by the tenderer and certified by Notary. Later the Original Undertaking should be submitted to this office by the successful tenderer. In case of failure to comply with the warranty obligation; this undertaking will be a valid binding document for taking legal action for default.

15. LED STREET LIGHT FITTING:

Fitting shall be of complete set with driver circuit, LED lamp etc. Fitting shall be similar to Bajaj make Model No. BCLST 25/40 W LED or any approved make.

When the fitting is mounted on pipe bracket, 25x6mm size GI clamps with fasteners shall be used for fixing the fitting on the building/ on pole. When fixing on building/ on the pole, wiring shall be extended from ceiling rose/from OH line with 1.5sqmm copper wires as part of fixing of fitting which included in fixing cost.

16. LED LIGHT FITTINGS AND STREET LIGHT FITTINGS

General requirements of LED Type (INDOOR/OUTDOOR) light fitting.

CEE/SWR specification No: SWR/LED LIGHT FITTING (Indoor/Outdoor) /001-2016

1	LED Make	NICHIA / OSRAM / SEQUL / PHILIPS LUMILEDS / CREE / LEDNIUM / AVAGO
2	Type of LED	High Power, SMD (Surface Mounting Device) LED
3	Lumen Output/Efficiency	> 100 Lumens / Watt
4	Lumen Output at fitting level/ Efficiency	> 75 Lumens / Watt
5	LED Life	> 50,000 burning hours
6	Depreciation	30% max, after 50,000 burning hours
7	Colour Rendering Index (CRI)	> 75
8	Nominal Voltage	220 V AC
9	Input Operating Voltage	105-295 V AC
10	Power Factor	> 0.9
11	Protections	
	i. Surge protection	1.5 KV for 50 micro seconds
	ii. Over voltage protection	300 V AC for 2 minutes
	iii. High voltage protection	1.72 KV AC for 1 minute
	iv. Insulation Resistance	Minimum 2 mega ohms with 500 V megger
12	Driver Type	Constant Current driver with short circuit protection
13	Driver Components	Industrial grade only
14	THD	< 20%
15	Efficiency of Driver Electronic	Efficiency of driver > 85%
16	Construction of Housing	Pressure die cast aluminum or CRCA or Extruded aluminum
17	Finishing	Power coated / anodized
18	Lamp Cover	Toughened glass of min. 0.8 mm thickness of sufficient strength of high transmittance efficiency (min.90%) Acrylic diffuser as per need of fitting
19	Secondary optics	Polycarbonate reflector / polycarbonate lence

Section:8B Technical Specifications

20	Mounting	Indoor: Suitable for Surface / Recessed / Hung Type Outdoor: Suitable for Existing pole etc.,
21	Ingress Protection	IP 20 - Indoor IP 65 - Outdoor.

NOTE

- Supplied LED Luminaires shall conform to BIS:16107 or IEC 62722 and LEDs to BIS:16103 or IEC: 62717
- LED Luminaires shall also conform to LM- 79 (For quoted fitting) and LM- 80 for LEDs used.
- Firms have to submit LM80& LM79 test certificate from National/International accredited Laboratory and OEM certificate for compliance of BIS/IEC along with offer.
- Firms have to submit warranty certificate for 5 (five) years along with supply
- Make of whole LED Luminaire shall be as per approved make

Following information's are to be furnished prior to supply of item and approval is to be obtained:

- Type of luminaire: Like Street light, Flood light, focus light, retrofit (for retrofit type luminaire, this specification may be referred wherever applicable)
- Total wattage of LED luminaire
- Arrangement of LED: Single LED/ Multi LED
- Dimensions if required.
- Indoor/ Outdoor
- Mounting type: i.e., Indoor: Suitable for Surface / Recessed /Hung Type
- Outdoor: Suitable for Existing Pole etc.

17. 1.5 TONNAGE AC UNIT (INVERTER TYPE):

The 1.5 TON ACs to be supplied shall meet the following parameters

Sl.no	Particulars	Technical specifications
1	Make	As per approved list of items
2	Tonnage	1.5 Tonne
3	Refrigerant	R 32
4	Rated Voltage	230V
5	BEE Rating	5 star
6	Rated frequency	50 Hz
7	Phase	Single Phase
8	Compressor	Rotary
9	Condenser coil	Copper
10	Cooling Capacity	5000 Watts minimum
11	Air Flow (Hi/ Mi/ Lo) in (m ³ /h)	875 minimum

The Stabilizer suitable for 1.5 TON split AC to be supplied should meet the following parameters.

- Similar to V-Guard model No. VG 400
- Capacity-12A
- Working Voltage-170V – 270V
- Time Delay-ITDS 3 Min±20 sec
- Thermal overload protection
- High voltage cut-off

18. EXHAUST FANS:

The exhaust fan shall be minimum of 3-star energy rating issued by BEE and conforming IS:2312

Technical parameters for Exhaust fan

Sl.no	Particulars	Technical specification
1	Make	As per approved list of items
2	Sweep	150/300 mm
3	BEE rating	3 Star
4	Rated power	150 W
5	Operating Voltage	230V
6	Rated Frequency	50 Hz
7	Air Delivery	280 m ³ /min
8	Guard	With Louver Shutters

19. DISTRIBUTION BOARD

Power Panel board shall be cubicle type made out of 16 SWG MS sheet powder coated consisting of copper bus bar arrangements and MCCB/MCBs/meters as per schedule. Copper Bus bars shall be of 4 no's each of cross section size 1 ½"x 1/8" or equivalent size.

Electronic energy meter shall be as per ESCOM approved make. Panel shall be erected on suitable stand or on CC foundation 1:3:6 mix or on the wall as instructed by Engr. in charge in concealed /surface manner.

MCCBs shall be adjustable type with 25KA breaking capacity.

MCBs shall be with C curve characteristics of 10KA category. Energy meter shall be fixed on suitable Hylem Sheet or suitably insulated from the panel board. AutoCAD drawings shall be submitted for approval before supply of panel board.

20. MINIATURE CIRCUIT BREAKER (MCB):

MCB DP/SPN/SP/FP/TPN of rating as specified in the schedule, 240 V/415V, 50 Hz. to automatically isolate the electrical circuit under sustained overloads or short circuits and comply to IS 13947.

MCB DB shall be powder coated made of 14 SWG MS sheet with all internal accessories. All MCBs shall be of 10 KA breaking capacity with 'C' curve characteristics.

21. MOULDED CASE CIRCUIT BREAKERS (MCCB)

MCCB shall be TPN of rating as specified in the relevant BOQ item and shall conform to IS- 13947/Pt-2/1993 (Ics = 100%Icu or as specified in the relevant BOQ item) with thermal release setting 70/80%-100% or fixed type as specified in the relevant BOQ item) with breaking capacity of not less than 25 kA for load currents up to 200 amp. & 35 kA for load currents above 200 amp rating. MCCBs shall be suitable for three phase, 415 Volt, AC supply.

22. RESIDUAL CURRENT CIRCUIT BREAKER RCCBS:

RCCB DP/TPN of rating as specified, 240/415V, 50Hz with IS:12640 part-1 with 10KA short circuit withstand capacity. The RCCB shall be fixed on the distribution board in suitable enclosure.

23. SINGLE PHASE ONLINE UPS

FAULT TOLERANT UNINTERRUPTED POWER SUPPLY (UPS) SYSTEM FOR PRS, EDP CENTERS AND OTHER SIMILAR REQUIREMENTS OF ONLINE UPS SYSTEM

23.1 Codes and standards

23.1.1 The UPS shall comply with the requirements of latest issue of relevant Indian Standard/ IEC. Some of the applicable IS/IEC standards are listed below:

IEC:62040-13. Ed. 1.0 b	Specification for UPS- General and Safety requirements
IEC:62040-2	Specification for UPS-EMC requirement
IEC:62040-3	Method of specifying the performance and test requirements of UPS
IS: 9000	Environmental test
IEC: 61643	Surge Protection Devices

23.1.2 The equipment shall also conform to the provisions of Indian Electricity rules and other statutory regulations currently in force.

23.1.3 In case of any contradiction between the standards listed in Cl. 2.1 and this specification, the requirements laid down in this specification shall prevail.

23.2 GENERAL REQUIREMENTS

23.2.1 The UPS system shall be an integrated system comprising of input rectifier, charger, inverter, static bypass switch and manual bypass switch. The charger shall be designed such that it shall be able to charge the battery in constant voltage, constant current mode. Charging capacity shall be at the rate of 0.1C ('C' is the AH capacity of the Battery).

23.2.2 The UPS system shall be suitable to feed all loads connected to output which are primarily computers, printers, servers, scanners, modems, etc.

23.2.3 The UPS system shall be of true double conversion with an in-built isolation transformer (copper wound) and shall be based on latest generation technology having proven performance of satisfactory operation for similar applications. UPS of up to 5 kVA capacity shall be provided with inverter of type PWM IGBT. In UPS of capacity higher than 5 kVA, inverter of type PWM IGBT (IGBT modules only) shall be provided. All components shall be of quality and reliability that satisfies the requirements of a secure AC power to vital equipment. Components shall be capable of withstanding the thermal and dynamic stresses resulting from internal and external short circuits and circuit switching operations, etc.

Section:8B Technical Specifications

23.2.4 The UPS shall be single phase system with single-phase input and single-phase output.

23.3 TECHNICAL REQUIREMENTS

23.3.1 Input Power Supply

23.3.1.1 The UPS shall be suitable for the following input power supply:

i)	For category A	
	Voltage	170V -270V for single 1 phase*
	Frequency	50 Hz $\pm$ 8%

Standard voltage range is 170V – 270V. Optionally, the purchaser can ask for voltage range of 140 V – 280V.

23.3.2 UPS design & performance requirements

- 23.3.2.1 Incoming AC supplies shall be converted to DC through input rectifier. The rectifier/charger shall operate according to the constant voltage current limiting principle and shall incorporate a “Soft Start” feature to gradually accept load on initial energizing.
- 23.3.2.2 The rectifier section/battery charger of the UPS system shall be capable of precise regulation to prevent damage to the battery. The output voltage of rectifier’s DC bus without the battery shall be stabilized to within 2% of set value during load variation between 0 to 100% of the rectifiers and specified mains input supply voltage variation. Current ripple content shall be less than 3% in the battery with battery connected.
- 23.3.2.3 An R.F. filter shall be provided at the input and output of UPS to suppress the radio frequency interference.
- 23.3.2.4 Transient/surge protection shall be provided in the input circuit to rectifiers to protect the UPS from surges & voltage spikes. Class C type SPD of appropriate rating with indication should be used where chances of lightning strikes are more or at those places where the chances of indirect surges in power supply are high. Otherwise, conventional surge protection with MOVs is to be done.
- 23.3.2.5 UPS shall be designed to operate satisfactorily while deriving power from an emergency diesel generating set. Suitable protection shall be provided in the control circuits to guard against electrical oscillations which may be present in the input supply as caused by emergency DG sets.
- 23.3.2.6 The UPS shall be provided with automatic sequence and power walk/ soft start in circuit(s) with appropriate time delay such that the rectifiers and inverters can start operating automatically when incoming AC power is restored allowing the UPS to be loaded automatically.
- 23.3.2.7 150 AH Sealed Maintenance Free (SMF) lead acid Batteries, having testing reports of NABL approved laboratory of one of the following makes ---

Section:8B Technical Specifications

AMARAJA/ Exide/ Bosch/ AMCO/ Hitachi shall be provided (2 Volt single cells or in the form of crate of 6V/12V preferable). With 180 mins backup.

23.3.2.8 For prescribing the battery VAH, the purchaser will consider the following:

- a. Load Power Factor of 0.65 to unity
- b. Minimum ambient temperature shall be taken as 27°C.
- c. Battery Current = Inverter rated VA X Power factor/ (Inverter efficiency X End cell voltage X No. of cells).
- d. Ageing factor of 0.8.
- e. Minimum end cell voltage for lead acid battery 1.75V per cell. Battery low pre-alarm to be set at 1.8 volts per cell.

23.3.2.9 The rectifiers/ chargers shall be designed to completely re-charge the battery in a maximum time of 10 hours after complete discharge. The rectifier/charger shall be sized based on the maximum inverter input load when inverter is delivering its rated output at 0.8 pf lagging and recharge the battery to nominal rated capacity of the battery.

23.3.2.10 The rectifiers/charger shall sense the battery charging current and adjust the DC bus voltage to maintain the charging current to pre-set level. A separate current limit circuit shall also be provided for adjustment of battery current. Subsequent to a discharge cycle when battery is connected to rectifier/charger, the battery current shall be monitored, controlled and limited to set value automatically, irrespective of the inverter input current. The rectifier shall be protected against reverse battery connection at dc link voltage.

23.3.2.11 The UPS output voltage waveform shall be sinusoidal. The Total Harmonic Distortion (THD) of voltage waveform at inverter output shall not exceed 3% considering any linear load up to maximum rated output of UPS system at rated power factor and shall not exceed 15% under non-linear load.

23.3.2.12 The UPS system shall be able to operate satisfactorily on rated loads (in kVA) with power factors in the range of 0.65 lag to 1.0. Under the aforesaid load, load pf and input voltage, the minimum efficiency requirement shall be as follows: 75% for ≤ 3 kVA.

23.3.2.13 The UPS shall have capacity to deliver a minimum overload of 125% for 10 minutes and 150% for 60 sec. UPS shall be provided with current limit circuit to avoid excessive loading beyond its permissible overload withstand capability.

23.3.2.14 Unless otherwise specified, the voltage variation shall not exceed $\pm 5\%$ and complete recovery to normal steady state shall be within 40 ms.

- a. 100% step load and unload (for hot standby only)
- b. 50% step load.
- c. Momentary interruption in power supply.
- d. Complete load transfer to other healthy UPS when one of the UPS develops a fault and automatic retransfer to the first UPS when it becomes healthy.

Section:8B Technical Specifications

For diode rectifier type load systems, a voltage variation of up to 100% for no more than 2 cycles is acceptable at load turn on.

- 23.3.2.15 The battery may be taken out of service for maintenance during which period it shall be possible for the UPS to continue operation by drawing power from the rectifier.
- 23.3.2.16 All the thyristors, diodes, IGBTs and other electronic devices of UPS shall be given adequate protection from short circuits.
- 23.3.2.17 All PCBs shall be provided with a transparent epoxy coating for environmental protection and topicalization. They shall be suitably located away from heat sources.
- 23.3.2.18 All electronic control and monitoring printed circuit cards shall be suitable for easy replacement. Monitoring points shall be provided with identification on each of the PCBs and the PCB shall be firmly clamped in position so that vibration or long usage does not result in loose contacts.
- 23.3.2.19 Fans, if any, shall be of good quality and high reliability. The failure of fan shall only cause thermal tripping at pre-set temperature, without causing any damage.
- 23.3.2.20 Maximum noise level from UPS system measured from a distance of 1 meter from UPS in all directions under rated load shall not exceed 55 dB
- 23.3.2.21 Maintenance bypass isolator – Provision shall be available for manually operated maintenance bypass isolator which shall be incorporated into the UPS cabinet to directly connect the critical load to the input AC power source bypassing the rectifier, inverter and static transfer switch.
- 23.3.2.22 The UPS shall have a data logging facility, with USB download capability. This will be an optional feature and is not to be provided, unless specifically called for in the indent / tender. The data logged shall be:
- a) 80 faults in a FIFO with date and time stamp (faults to be recorded include, but are not limited to those listed in section 4 (B))
 - b) The LCD display shall enable interrogation of the fault data log by the operator

23.3.3 Construction

- 23.3.3.1 Rectifier/charger, inverter and static switch sections shall be suitably housed in sheet steel panels complete with all interconnections. The panels shall be fabricated with cold rolled sheet steel/ structural steel min. 1.2 mm thick. The panels shall be free standing, fitted with suitable louvers for ventilation and cooling fans as required. Hinged doors shall be provided at the front. The enclosure shall provide minimum IP-20 degree of protection.
- 23.3.3.2 UPS system shall be suitable for either floating output or earthed neutral, or earthing of star point, in case of single phase/three phase system respectively.

Section:8B Technical Specifications

- 23.3.3.3 The power supply for fans shall be tapped from UPS output. However, the rating of UPS as specified in the data sheet shall be the net output of UPS after deducting power consumption for fans, etc.
- 23.3.3.4 A suitable sized earthing point shall be provided either at the bottom of the panels or at the back side of the panels.
- 23.3.3.5 Cables and terminal blocks (if any) for power or control cable connections should be of appropriate voltage, current and temperature rating.
- 23.3.3.6 All control wiring shall preferably be enclosed in plastic channel or otherwise neatly bunched together.
- 23.3.3.7 All metal surfaces shall be thoroughly cleaned and de-greased to remove mill scale, rust, grease and dirt. Fabricated structures shall be pickled and then rinsed to remove any trace of acid. The exterior of the panel shall be spray painted with two coats of epoxy-based panel paint or powder coated.
- 23.3.3.8 Battery Accessories: Batteries if provided outside the UPS system, shall be in a formation which is commensurate with the available space. The stand shall be made of standard L angle channel and duly spray painted with two coats of epoxy-based panel paint or powder coated.

23.3.4 PROTECTION/INDICATION/METERING ETC.

(A) Following protections shall be available:

- i) Overload.
- ii) Short circuit at output of UPS.
- iii) Over and under voltage at battery terminals.
- iv) Over temperature
- v) Input surge protection.

(B) Following indications shall be available:

1. Charger On/Main's presence.
2. Mains Normal / Abnormal.
3. Low Battery.
4. Load on bypass.
5. UPS On.
6. UPS Trip.
7. Audible alarm for mains failure, battery low pre-alarm, battery low trip and inverter trip.
8. Visual indication and audio alarm near working place of operators.
9. Indication for SPD failure.

(C) Monitoring by analogue Meter/LCD Display for the following:

- i) AC Input voltage
- ii) AC Output voltage
- iii) AC Output current

Section:8B Technical Specifications

- iv) Battery voltage
- v) Battery charging & discharging current
- vi) Output frequency
- vii) Fault Data

23.4.1 Controls

- (a) Inverter ON/OFF switch (to initiate inverter operation).
- (b) Emergency shut down switches on the panel.

23.4.2 Reliability

All necessary care shall be taken in selection, design and manufacture, testing and commissioning of the equipment for ensuring high system reliability.

23.5 TESTS

Separate acceptance, routine and investigation tests for UPS shall be conducted.

23.6 GUARANTEE

- i. One Year for UPS.
- ii. Two Year for battery.

24. POWER CONTACTOR:

The power contactor to be supplied should meet the following parameters

Sl. No	Particulars	Technical Specifications
1	Number of Main Contacts (NO)	3
2	Number of Main Contacts (NC)	0
3	Number of Auxiliary Contacts (NO)	1
4	Number of Auxiliary Contacts (NO)	0
5	Rated Operational Voltage	Main Circuit 690 V
6	Rated Frequency	Main Circuit 50/60 Hz
7	Rated Operational Current	(690 V) 40°C 60A (220/240 V) 55°C 60A
8	Maximum Breaking Capacity	Cos Ø=0.45 (Cos Ø=0.35 for I _e > 100 A) at 440V 820A Cos Ø=0.45 (Cos Ø=0.35 for I _e > 100 A) at 690V 340A
9	Rated Impulse Withstand Voltage (U _{imp})	6 kv
10	Terminal Type	Screw Terminal

25. TIME RELAY:

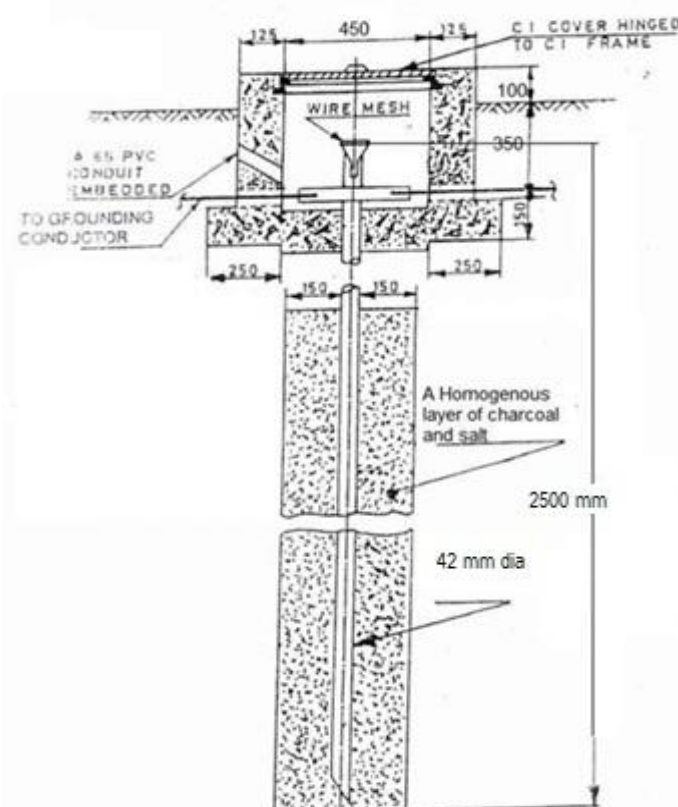
Sl. No	Particulars	Technical Specifications
1	Time Relay Type	ON-Delay
2	Rated Control Supply Voltage	220-240 V AC
3	Rated Operational Current	(230 V) 4A
4	Output	1 c/o (SPDT) Contact
5	Terminal Type	Screw Terminal
6	Mounting	DIN Rail Mounting

26. DIGITAL TIME SWITCH:

Sl. No	Particulars	Technical Specifications
1	Rated Operational Voltage	230 V AC
2	Rated Impulse Withstand Voltage (U _{imp})	Maximum 4 kv
3	Maximum Switching Current	16 A
4	Rated Frequency	50 Hz
5	Contact type	Change-over (CO)
6	Battery Chemical Composition	Lithium
7	Battery Life	5 Years
8	Battery Type	Button Cell

27. EARTHING ARRANGEMENTS:

Perforated steel galvanized pipe of 'B' class of 42mm dia and 2500 mm long shall be erected in an earth pit as shown in drawing below. The earth wire used shall be of GI strip of size 25mm x 3mm for HT and 8 SWG GI wire for LT with suitable clamping of size not less than 25 x 3mm on to the terminal structure and embedded in concrete for raising to the top of terminal structure. Both ends of the GI strip/GI wire should be fixed with GI bolts, nuts and spring washer. An RCC slab of size 450 x 450 x 40mm thick is to be placed over RCC box/brick masonry work. Earth box shall be painted above the ground level to facilitate painting of earth values. The earth pit shall be filled with alternate layers of charcoal and salt each of thickness 150 mm and 200 mm surrounding the pipe. The earth value when measured individually and combined should be less than 10 ohms. 8 SWG GI earth wire shall be used for earthing single pole structure. In the ground GI wire shall be buried at a depth of 0.5m and connected to the earth terminal. Earth resistance value in ohms, earth pit No. and date of testing to be painted in the plinth by white paint. Supply of GI pipe and all accessories for earthing (excluding GI wire/ flat) is included in the scope of work for earthing arrangements.



28. GI EARTHING STRIPS

28.1 Scope:

This section of the specification covers the supply, erection, testing and commissioning of Galvanizes Iron Earthing Strips for the Distribution Network equipment's.

28.2 Applicable Standards:

The galvanizing and testing of materials shall confirm to the latest edition of the following standards except otherwise specified in the specification. Recommended practice for hot dip galvanized of Iron Earthing Strips	IS: 2629(1966)
Methods of testing weight, thickness & uniformity of coating on hot dip galvanized articles	IS: 2633(1972)
Specification for hot dip galvanized coating on fastness I	IS: 5358(1969)
Specification for Electroplating	IS:3203
Specification for hot dip Zinc coating on structural & other allied products	IS: 4759(1968)

28.3 General Technical Requirements:

MATERIAL

Supplier has to purchase raw materials (MS Flat) as per relevant IS at his own cost. The zinc required for galvanizing shall be quality Zn-98 & shall confirm to IS: 209- 1966 and its latest amendments. The Supplier

Section:8B Technical Specifications

shall make his own arrangement for procurement before the commissioning of work, sufficient quantity of electrolytic zinc of proper quality for galvanizing. The Supplier shall however, not link the delivery period with the supply of zinc. The KRIDE is at liberty to have sample of zinc used and to test in any laboratory at his own cost and reject the particular supply, if found below standard. All raw materials required for galvanizing etc. and for complete execution of work shall be stocked in adequate quantities by the Supplier to ensure that the progress of work is not hampered.

GALVANISING

Fully galvanized Iron strips shall be used. Galvanized Iron strips shall confirm to IS: 2629 (1966). The zinc deposition should not be less than 610 grams/meter square of the galvanized surface area of the MS Earthing strips. All galvanized materials shall withstand test as per IS: 2633 (1972). The weight of zinc coating shall determine as per the method stipulated in IS: 2633(1964). The standard length of Galvanized Iron Earthing Strip shall be minimum 7 Mtrs and not exceeding 10 Mtrs.

29. ERECTION OF STAY SET:

The stay shall be erected in a pit of size 1.2m long x 0.6M width and 1.3M depth in a mass concrete of 1:3:6 mix, coping of 0.3mx0.3mx0.3m, smoothly finished. The stay set should comprise of stay rod, base plate of size 300x300x10mm, stay wire, stay insulator and stay clamp of size not less than 50mmx10mm size. The stay wire shall be of 45T quality, 7/11 SWG size steel galvanised, complete with stay tightner. All metallic parts shall be applied with one coat of primer red oxide and two coats of aluminium paint.

30. SINGLE POLE STRUCTURE WITH CROSS ARM FOR THE 11KV HT LINE:

The S.P structure is made out of RCC poles of 9 Mtr. long 145 Kgs working load. The structure shall be erected in concrete foundation of mix 1:3:6 with coping of 0.3M x 0.3M x 0.3M size of 1:2:4 mix smoothly finished. Size of pit shall be 0.6M x 0.6M & depth shall be 1.65 Mtr. Painting shall be as in DP structure. Scope includes 11 KV cross arm, pin insulators, clamp with bolts (similar in LT) etc. and HT single top support.

31. DOUBLE POLE STRUCTURE FOR TRANSFORMER (3.3mtr width - Pole centre to centre)

DP structure is made out of RCC poles of 9 Mtr. long of width 3.3mtr (it shall be adjusted to get 3 Mtrs width from pole to pole). The flats used for the manufacture of clamps shall not be lesser than 50mm x 10mm size (However flat size equivalent available commercially is acceptable). The structure shall be erected in concrete foundation of 1:3:6 mix with coping of 0.3M x 0.3M x 0.3M size smoothly finished. One coat of red oxide paint and two coats of aluminium paint should be applied for the MS items. Signal red colour band painted to a height of 150mm should be applied just below the Anti-climbing device on each pole. Size of foundation pit shall be 0.8 x 0.8 m & depth shall be 1.75 Mtr. The assembly includes supply & erection of fasteners, 11 KV disc insulators -3Nos., Danger board- 2 Nos. and standard anti-climbing device-2 Nos etc. (Pin insulators are not in scope of supply of DP structure) Transformer shall be erected on the DP structure by means of 100x50mm channels- 2nos and with suitable guide rails (channels) for supporting the transformer.

Scope includes supply and fixing of additional 100x50mm channel -1no for fixing HT disc insulators, 75x40mm channels -2nos necessary for fixing LA/pin insulators and DOL and angle cross arms of 65x65x6mm for fixing pin insulators/ transformer top body support as applicable.

32. LIGHTNING ARRESTOR:

Lightning arrestors shall be polymeric type with ground disconnector suitable for 11 KV system of grade 10KV 5 KA type conforming to ISS 3070 Part-I latest.

33. GANG OPERATED SWITCH: (GOS)

33.1 **Scope:** This specification covers the manufacture, testing and supply of 11KV Group operating switches of single break 200 Amps. Capacity complete with accessories, such as operating pipe, connecting pipe guides, supporting insulators, link work and locking arrangement, etc., complete conforming to IS-9921(Part 1 to 5) and the enclosed typical drawings.

33.2 **Weather Conditions:** The switches are to be installed at places with the following weather conditions.

Temperature	: Maximum ambient	- 45°C
Daily average	: Average	- 35°C
	: Minimum	- 5°C
	: Altitude	- Not to exceed 1000 Mtrs. above sea level

33.3 The equipment offered shall conform to IS-9921 and latest amendments thereof. The switches shall be suitable for horizontal upright mounting.

33.4 **Construction:**

33.4.1 The base shall be made of robust rolled M.S. channel section of size 75 x 40 x 6 mm. All ferrous parts shall be hot dip galvanized and all copper parts shall be tinned. The rotating parts shall be fitted with suitable bearing.

33.4.2 The blades and contacts shall be made of best quality electrolytic copper and shall be capable of carrying the rated current without exceeding the temperature limits specified in table-4 of IS-9921 (part-II).

33.4.3 The insulators shall be of post type, brown glazed porcelain pedestal post type design E.22 as per ISS:5350 (Part-III)/1971 with cap screws and spring washers and to technical specification enclosed conforming to IS:2544-1973 with amendments thereof.

33.4.4 The operating pipe shall consist of Tandem pipe (spindle rod) of length 2000 mm and the vertical pipe of length 5400 mm. The pipe shall be seamless 25mm diameter "B" type class (i.e., medium class) G.I. Pipe. The G.I. Pipe used shall conform to IS-1239-Part-I-1979 and amendments thereof. A guide shall be provided to the vertical operating pipe an intermediate position to arrest its lateral movement. Necessary fixing arrangements of the guide to the pole should also be supplied.

33.4.5 The Tenderer shall clearly indicate in the tender, the Brand name of the insulators used in manufacture of 200 Amps Single Break GOS along with relevant type test reports. The successful bidder should get the insulator make approved by KRIDE, before making supplies.

33.4.6 95 Sq mm heavy duty long barrel tinned copper lugs-6 Nos., suitable for terminating Weasel/Rabbit ACSR Conductor shall be provided for connecting conductor to the copper flats in the GOS.

33.4.7 All the iron parts shall be hot dip galvanized and shall conform to the relevant IS specifications with latest amendments those of.

33.4.8 **Arcing Horns:** The switches shall be supplied with hot dip galvanized arcing horns so that while closing or opening the switches, arcing takes place between the arcing horns and not between the main contacts.

Section:8B Technical Specifications

33.4.9 **Locking Arrangements:** Suitable locking arrangements shall be provided for the operating handle.

33.4.10 The switches shall be designed to withstand the test voltage as per IS: 9921 or its latest revision thereof. The switches shall be designed to have the following current ratings.

Continuous current carrying capacity

Without over heating : 200A

Short Time Current for 1Second rating : 8 kA

Rated peak dynamic withstand current : 20kA

33.5.0 **Test and Test Certificate:**

33.5.1 **Routine Tests:** The Routine test as per IS:9921 shall be conducted on each G.O.S in the presence of KRIDE representative and certificate shall be submitted duly signed by a responsible officer of the tenderers/organization before dispatch of consignment.

33.5.2 KRIDE/ Railway reserves the right to get the type test conducted as per IS:9921 on a selected G.O.S in the presence of KRIDE's/Railway's testing staff at the cost of the supplier.

- 1) Impulse Voltage dry test
- 2) Power frequency voltage dry test
- 3) Power frequency voltage wet test
- 4) Temperature rise test
- 5) Measurement of resistance
- 6) Test for rated peak short circuit current
- 7) Operation test
- 8) Mechanical endurance test

33.5.3 **Packing:** The group operating switches shall be securely packed to withstand rough handling during the transit and storage.

33.5.4 **Name Plate:** The group operating switch shall be provided with the name plate legibly and indelibly marked with the following information:

- 1) Name of materials
- 2) Name of the manufacturer/Trade mark
- 3) Purchase order No. and Date
- 4) Type-designation and Sl. No.
- 5) Rated voltage
- 6) Rated current
- 7) IS specification

TECHNICAL SPECIFICATION FOR 11KV PEDESTAL POST INSULATORS

General Requirements:

Section:8B Technical Specifications

The porcelain shall be sound, free from defects, thoroughly vitrified and smoothly glazed, the glaze on insulators shall be brown in colour and should cover all exposed porcelain parts except those areas which serve as supports during fixing are required to be left unglazed as detailed in IS:2544-1963.

Precaution shall be taken during design and manufacture to avoid the following:

- a) Stress due to expansion and contraction which may lead to deterioration.
- b) Stress concentration due to direct engagement of the porcelain with the metal fittings.
- c) Retention of water in recesses of metal fittings and shape which do not facilitate easy cleaning by normal methods.

All metal parts except those of stainless steel shall be hot dip galvanized after machining zinc coating shall satisfy the requirement of relevant IS specification. The finished galvanized surface shall be smooth.

The threads of the tapped holes on the post insulator metal fittings shall be cut after galvanizing and shall be protected against rust by greasing or other similar means. All other threads shall be cut before galvanizing.

The post insulator unit shall be assembled in a suitable jig to ensure the correct positioning of the top and bottom metal fittings relative to one another. The faces of the metal fittings shall be parallel and at right angles to the axis of the insulator and the corresponding holes in the top and bottom metal fitting shall be in vertical plane containing the axis of the insulator.

Technical Particulars:

- | | |
|--|---|
| Individual Units | : 11kV stacking units. |
| 1) Rating | : 11kV |
| 2) a) Unit description (as per ISS:5350/Part-III/1971) | : E-22 (Except torsion strength : as specified) |
| b) Mechanical strength as per Clause 3.2 of IS:5350/ Prt-III/1971. | : Strength class 'C' 7.5 to 12KN |
| 3) Highest system voltage | : 12 kV (rms) |
| 4) Impulse withstand voltage | : 75 KV (peak) |
| 5) One minute Power frequency withstand Voltage | |
| | Dry : 35 kV (rms) |
| | Wet : 35 kV (rms) |
| 6) Power Frequency Puncture withstand voltage (rms) | : 1.3 times the actual dry flash cover voltage of the unit. |
| 7) Visible Discharge test voltage | : 9 KV (rms) |
| 8) Creepage distance | : 230 mm |

Section:8B Technical Specifications

- 9) Failing load (as per IS:5350 Part-III/1971)
 - (a) to (d) in Newtons and
 - (e) in Newton meters
 - a) Upright : 9000 N
 - b) Under hung : 4500 N
 - c) Tension : 20000 N
 - d) Compression : 40000 N
 - e) Torsion : 340 Nm
- 10) Height of insulator (Min) : 254mm (Tolerance ± 1 mm)
- 11) Insulating part dia (Max) : 152 mm
- 12) Top metal fitting pitch circle dia : 57 mm
- 13) Bottom metal fitting pitch circle dia : 57 mm
- 14) a) No. of bolts : 4 Nos.
- b) Bolts holes dia : 10 mm tapped holes at the top and 12 mm plain holes at the bottom.
- c) Nominal dia of mounting : 85 mm
- face not to exceed

Marking: Each insulator shall be legibly and indelibly marked with the following.

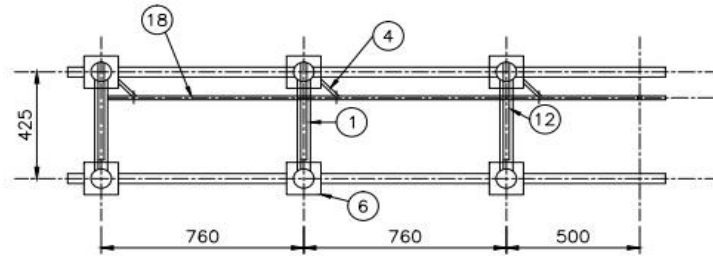
- a) Name or trade mark of the manufacture
- b) Month and year of manufacture
- c) ISI certificate mark if any

Marking shall be durable and shall be printed by the transfer process before firing.

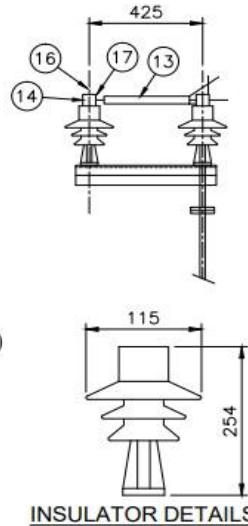
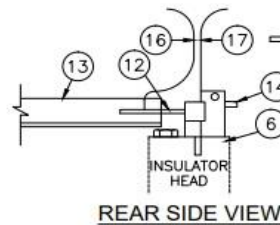
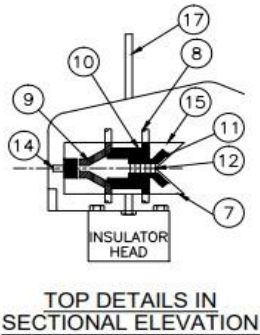
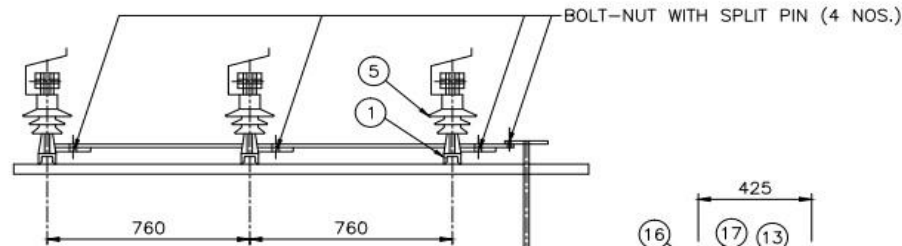
NOTE: Manufacturer's Test Certificate and type test certificate conducted on similar sample insulator shall be submitted for approval before commencement of supplies.

Bill of Materials as per Drawing.

Section:8B Technical Specifications



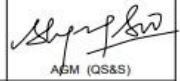
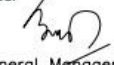
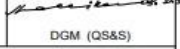
11KV 200A GOS (SINGLE BREAK)



SL. NO.	DESCRIPTION	SIZE	SECTION IN mm	QUANTITY
1.	M.S CHANNEL	500mm	75x40x6	3 NOS.
2.	GUN METAL BUSH (TOP) FOR SPINDLE (STANDARD PARTS NOT SHOWN IN THE DRG.)	10mm HT.	25mm ϕ	3 NOS.
4.	SPINDLE PLATE WITH SPINDLE	290mm	75x6mm	3 NOS.
5.	11KV POST INSULATOR	—	—	6 NOS.
6.	TOP PLATE	100mm	50x6mm	6 NOS.
7.	CONTACT BOX (BOTTOM)	110x16mm L3mm Th	42mm W	3 NOS.
8.	COPPER CONTACT PIN (TINNED)	8mm ROD	50mm L	12 NOS.
9.	PHOSPHOR BRONZE COPPER STRIPS (TINNED)	100 (0.5Th.)	25mm W	12 NOS.
10.	SPRING(STAINLESS STEEL)	25mm Long	14G	12 NOS.
11.	COPPER CONTACT (TINNED)	90mm	25x6	6 NOS.
12.	COPPER KNIFE (TINNED)	460mm	32x6	3 NOS.
13.	MOVABLE ANGLE	400mm	45x45x5	3 NOS.
14.	LEADING FLAT, COPPER (TINNED)	190mm	25x6	3 NOS.
15.	CONTACT BOX (TOP)	110x16mm	3mm Th, 32mm W	3 NOS.
16.	MOVABLE ARCING HORN	300mm	8mm ϕ	3 NOS.
17.	FIXED ARCING HORN	300mm	8mm ϕ	3 NOS.
18.	HORIZONTAL G.I PIPE	2000mm	25mm ϕ B-CLASS	1 NO.
19.	VERTICAL G.I PIPE	5400mm	25mm ϕ B-CLASS	1 NO.
20.	HANDLE PIPE	500mm	25mm ϕ B-CLASS	1 NO.
21.	LOCKING ARRANGEMENT	PLATES 6mm	210x90, 100x90, 360x90, 300x50	4 NO.
22.	NUT & BOLTS 80 x 10mm - 24 NO, 25mm LONG- 5 NO, 30mm - 18 NO, 32mm LONG - 60 NO. ABOVE MENTIONED NUT & BOLTS ARE 10mm ϕ			
23.	64 x 12mm - 4 NO. ABOVE MENTIONED NUT & BOLTS ARE 10mm ϕ			

NOTES:-

- ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
- THE INSULATORS USED IN GOS SHALL BE GOT APPROVED BEFORE PLACING THE PURCHASE ORDER.
- ALL COPPER PARTS ARE TO BE TIN PLATED.
- ALL BOLT NUTS USE FOR OPERATING ANGLE SHALL BE WITH SPLIT PIN.
- THE CONNECTING END OF BOTH MOVING AND FIXED CONTACT SHOULD BE FITTED WITH WEDGE CONNECTORS (RABBIT TO RABBIT)
- CREEPAGE DISTANCE OF POST INSULATOR SHALL BE 320mm(Min.)
- ALL FERROUS PARTS SHALL BE HOT DIP GALVANIZED.

	Signatures	All dimensions are in mm unless otherwise stated.	ಬೆಸಕಂ BESCOM
Chd	 ASM (QS&S)	11 KV, 200A SINGLE BREAK ISOLATOR	Approved:  General Manager,(Elec.) QS&S
Sub	 DGM (QS&S)		DRG.NO.BESCOM/CM/QS&S/23 REV-004 DATED:24-01-2022
	SCALE: N.T.S		

34. DROP OUT FUSE:

Drop out fuse shall be out door expulsion type fuse cut out 11 KV 200 A capacity single phase with 2 Nos. of post type insulators mounted on M S Channel of size 75x40mm with clamp of size 50x10mm on DP structure. All hard ware parts shall be hot dip galvanised. The DOLO set of fuse unit will have three Nos. of single-phase fuses to cater for three phases.

35. INDUSTRIAL CABLE FOR SUBMERSIBLE PUMP:

Flat submersible Three Core PVC Insulated & PVC Sheathed Industrial Cable for Submersible Pump Motors for working voltage up to and including 1100 volts and conforming to IS694 shall be provided.

36. SINGLE CORE PVC INSULATED FLEXIBLE COPPER CONDUCTOR CABLES FOR VOLTAGE GRADE 650 / 1100 VOLTS

Single Core PVC insulated multi stranded flexible copper cable conforming to IS: 694-2010 or its latest editions with bright annealed based copper conductor as per IS: 8130 of 1984 or its latest editions, working voltage 650/ 1100 volts with ISI marked of following sizes: a) 1.5 sq.mm (22/0.3 mm) b) 2.5 Sq.mm (36/ 0.3 mm) c) 4.0 sq.mm (56/0.3 mm) d) 6.0 sq.mm (84/0.3 mm)

37. LOW TENSION PVC INSULATED UNDER GROUND CABLE:

1.1 kV LTUG Cable having stranded aluminium conductor PVC insulated extruded Inner sheathed Armoured LT UG cable as per IS-1554 (part-1) or IS-7098 Part-1,armouring strip thickness and resistivity as per IS-3975 & confirming to GTP (Guaranteed technical particular) with overall satisfactory performance for minimum period of 5 years.

38. HIGH TENSION UNDER GROUND CABLE:

HTUG cable to supply shall be high tension 11KV cable, Dry Curing & Dry Cooling with true triple extrusion, simultaneously through a single common head, 3 core underground XLPE(E) cable having stranded compact circular aluminium conductor, screened insulated, insulation screened with extruded semiconducting compound in combination with copper tape, core laid up extruded inner sheathed of GI flat strip armoured and overall PVC sheathed with specified IS 7098 with latest amendments & conforming to the (Guaranteed technical particular) GTP with overall satisfactory performance for minimum period of 5 years.

The cable should be suitable for AC 3 phase, 50 Hz., earthed system and shall conform to ISS:

7098/P1/88, P2/85, P3/93 (or) latest with up-to-date amendments in all respects and the "HT" cable armoured should be earthed by GI flat to the nearest GI flat main which is about 3-4 mtr. in length.

39. OUTDOOR CABLE JOINTING KIT FOR HT UG CABLES:

HT, 11 kV, Outdoor, cable jointing kit to suit 3 core, XLPE cable of size as indicated in the schedule with complete kit for termination on DP structure. This comprises of supply including fixing of cable jointing kits and jointing of cables to the OH lines. The jointing kit shall be tested as per IS:13573 (with latest amendment) also necessary test certificates shall be submitted with supply of this item. Jointing kit shall

Section:8B Technical Specifications

be heat shrinkable/ push on type as required by ESCOM authorities. In case of LT pot head fitting, it shall be of complete set with filling compound.

40. METHODS OF LAYING OF LT CABLES:

When the cable is to be laid in trenches, two layers of sand coarse of 150mm and 150mm thickness respectively shall be provided on both bottom and top of the cable. When the cable is to be run on members of supporting structures /shelters/ wall, the same shall be clamped with MS clamps made out of 25mm x 3mm thickness flats, spaced not more than 1.0 M apart and cost shall be borne by the contractor. The minimum internal dia of bends of multicore PVC insulated LT cables shall not be lesser than 15D where D is the diameter of the cable to be laid.

- **CABLE LEADING/PROTECTING PIPE:**

The cable protecting pipe shall be heavy duty rigid PVC pipe of dia given in the schedule. The pipe shall be secured with either walls or posts using clamps made out of MS flats of 25 mm wide and 6 mm thick, spaced not more than 1.0 M apart. The clamps shall be applied with one coat of red oxide and two coats of aluminium paint. The top of the leading pipe shall be sealed with sealing compound to prevent entry of water. The PVC pipe shall conform to IS 4985-2000, latest and shall be capable of withstanding 6 kgf / sq.cm pressure.

Raising of cables on terminal structure: Cables shall be raised on terminal structures as well as in deep cuttings through PVC pipes of 40/50mm/75mm & 100mm inner dia 3.0 M long, of which 1 M is buried in the ground. The pipe shall be fixed to the terminal structure with clamps made out of flats of size 25mm width and 6mm thick with suitable bolts and nuts spaced not more than 1 metre apart. The diameter of bends in cable should not be lesser than 20 d for HT & 15d for LT where 'd' is the diameter of the cable. The top of the pipe shall be filled with sealing compound to prevent entry of water.

- **EXCAVATION OF CABLE TRENCH:**

a) Trench for cable on either side of track: The trench shall be of 0.5 to 0.75 M width and 1M depth for LT cables. A bed of sand of 150mm is spread for entire width at the bottom of the trench. The excavated earth is filled up in the trench and the trench is made to the original ground level by watering and ramming processes.

b) Trench for cable underneath the track/road: HT/LT cables shall be drawn through HDPE pipe.

Trench to accommodate HDPE pipe shall be of suitable width and excavated at 1.5 M below the formation level. No sand cushioning and spreading of bricks are required. But once the pipes are laid in the trench, it should be made to its original formation level by filling it up with excavated earth by watering and ramming process and resetting the ballast of track to its original level. Similarly, wherever road has been dug for laying the cable the same should be filled, rammed and asphalted and brought to original condition.

Note:

1. Excavation means, earthwork for laying of cable, erection of structures, stay, strut etc., irrespective of soil condition.
2. If any tar road requires to be excavated, it will be classified under Item (b) above.

• **CABLE ROUTE INDICATOR:**

The description of cable route indicator (cable marker) is detailed in the schedule. Construction of cable marker and lettering shall be as specified by Engineer in Charge.

It shall be spaced not more than 25m apart. It should be placed at the following places also.

1. On either side of track/road exactly at points where HDPE pipe ends.
2. At points where there are changes in the route of cable laying.

41. GALVANISED OCTAGONAL POLE 5 Mtr LONG (SINGLE/ DOUBLE ARM BRACKET)

The Octagonal pole shall be made of hot dip galvanized 3 mm thick steel sheet with BSEN 10025 grade S355 JO steel plate for shaft, IS 2062 for base plate with door opening arrangements, including suitable boards, Bakelite sheet and MCBs as per IS specifications suitable to withstand the wind speed of 47 m/s for 5m Pole in single section and single joint welded as per IS 9595/IS10178AWS having dimensions, Top 70mm A/F and Bottom 130 mm M/F with Base plate 200 x 200 x 12mm and inbuilt junction box with single/ double arm bracket with 1000 mm standard 40/ 50 mm dia, B class GI pipe bracket for mounting of light fitting.

The Octagonal pole shall be erected by excavating a pit and concreting the foundation in all kinds of soil with plastering above ground level, with base plate 200x200x12mm, installed by means of 4 nos of foundation bolts of suitable size/nuts/check nuts and provided with inbuilt junction box and suitable power strip connector and 16A cut out shall be provided inside the box. the Pole shall be hot dip galvanized in single dipping with not less than 65micron as per ASTM-A123 and 153 etc., as per drawing appended.

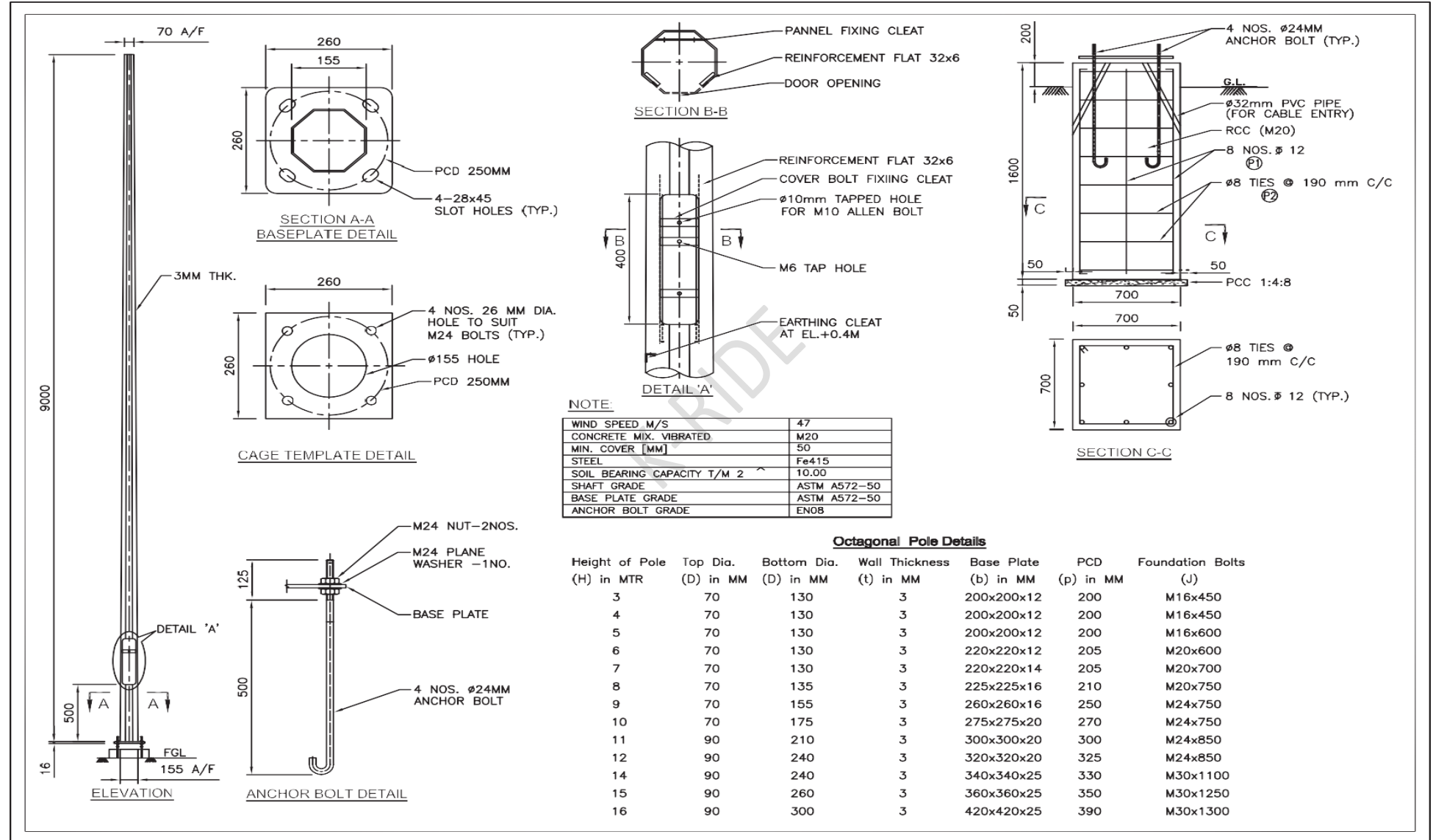
PCC foundation in 1:4:8 mix of size 0.05m depth x 0.7m width x 0.7m breadth shall be provided
RCC foundation in 1:1.5:3 mix of size 1.6m depth x 0.7m width x 0.7m breadth shall be provided for erecting the pole.

Steel reinforcement to the foundation shall be provided as appended in the drawing.

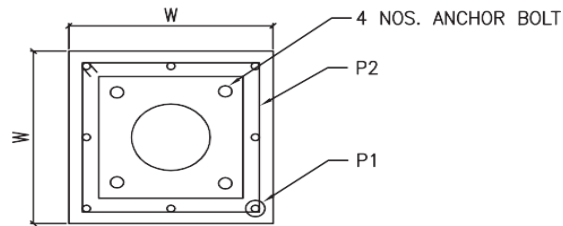
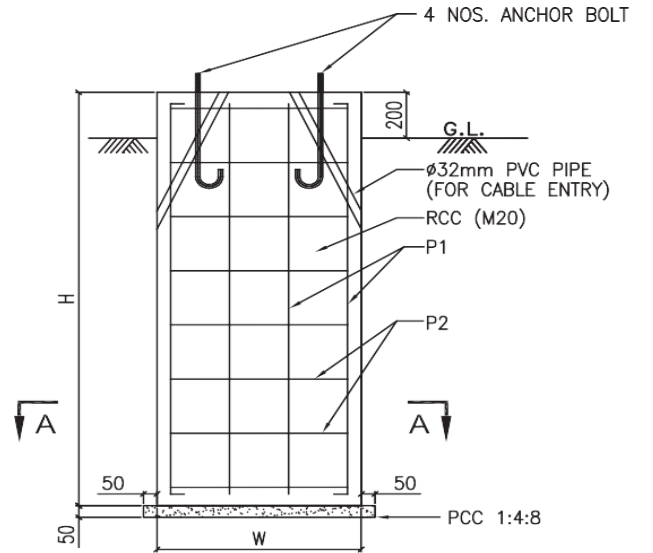
Excavation and clearing the balance soil shall be in contractors' scope of work. Foundation above ground level shall be adjusted as per the instruction of Engr. in charge as per site condition.

32mm dia PVC pipe shall be provided for cable entry while casting the foundation.

Section:8B Technical Specifications



Section:8B Technical Specifications



SECTION A-A

* ABOVE FOUNDATION DETAILS BASED ON WIND SPEED 47 m/s FOR NORMAL SOIL CONDITION

NOTES:

1. ALL DIMENSIONS ARE IN 'MM' UNLESS OTHERWISE SPECIFIED.
2. MATERIAL AND CONSTRUCTION TO BE IN ACCORDANCE WITH IS: 456.
3. THE CONCRETE GRADE FOR FOUNDATION AND OTHER WORKS SHALL BE OF MIX M20 U.N.O.
4. IT IS ASSUMED THAT SOIL TYPE IS CLAY SOIL
4.1 THE SOIL BEARING CAPACITY IS 10.0 T/m²
5. REINFORCEMENT SHALL BE OF GRADE Fe415 COMPLYING WITH IS:1786-1985.
6. CLEAR COVER TO MAIN REINFORCEMENT AT END OF MAIN BARS COLUMN : 40MM
7. DEVELOPMENT LENGTH FOR TENSION LDT =50 TIMES THE DIA OF BAR.
8. FOR ANY OTHER DETAILS CLAUSES OF IS-456, SP-34 AND SP-23 SHALL BE REFERRED.
9. IT IS ASSUMED THAT WATER TABLE IS NOT FOUND

BAR BENDING DETAILS

SR. NO.	HEIGHT (M)	SHAPE	RCC (M ³)	PCC (M ³)	STEEL (Kg.)	RAFT REINFORCEMENT	
						BOTTOM REINF. BOTH SIDE P1	TOP REINF. BOTH SIDE P2
1	3	OCTAGONAL	0.350	0.018	15.53	8 Φ 12	Φ 8 @ 190 C/C
2	4	OCTAGONAL	0.350	0.018	15.53	8 Φ 12	Φ 8 @ 190 C/C
3	5	OCTAGONAL	0.350	0.018	15.53	8 Φ 12	Φ 8 @ 190 C/C
4	6	OCTAGONAL	0.540	0.025	18.34	8 Φ 12	Φ 8 @ 190 C/C
5	7	OCTAGONAL	0.540	0.025	18.34	8 Φ 12	Φ 8 @ 190 C/C
6	8	OCTAGONAL	0.676	0.028	19.76	8 Φ 12	Φ 8 @ 190 C/C
7	9	OCTAGONAL	0.784	0.032	20.47	8 Φ 12	Φ 8 @ 190 C/C
8	10	OCTAGONAL	0.900	0.036	26.93	12 Φ 12	Φ 8 @ 190 C/C
9	11	OCTAGONAL	1.152	0.041	30.93	12 Φ 12	Φ 8 @ 190 C/C
10	12	OCTAGONAL	1.458	0.050	32.49	12 Φ 12	Φ 8 @ 190 C/C
11	14	OCTAGONAL	2.178	0.144	43.72	16 Φ 12	Φ 8 @ 190 C/C
12	15	OCTAGONAL	2.880	0.169	50.09	16 Φ 12	Φ 8 @ 190 C/C
13	16	OCTAGONAL	3.125	0.182	58.19	20 Φ 12	Φ 8 @ 190 C/C
14	3	CONICAL	0.350	0.018	15.53	8 Φ 12	Φ 8 @ 190 C/C
15	4	CONICAL	0.350	0.018	15.53	8 Φ 12	Φ 8 @ 190 C/C
16	5	CONICAL	0.350	0.018	15.53	8 Φ 12	Φ 8 @ 190 C/C
17	6	CONICAL	0.540	0.025	18.34	8 Φ 12	Φ 8 @ 190 C/C
18	7	CONICAL	0.540	0.025	18.34	8 Φ 12	Φ 8 @ 190 C/C
19	8	CONICAL	0.676	0.028	19.76	8 Φ 12	Φ 8 @ 190 C/C
20	9	CONICAL	0.784	0.032	20.47	8 Φ 12	Φ 8 @ 190 C/C
21	10	CONICAL	0.900	0.036	26.93	12 Φ 12	Φ 8 @ 190 C/C
22	11	CONICAL	1.152	0.041	30.93	12 Φ 12	Φ 8 @ 190 C/C
23	12	CONICAL	1.458	0.050	32.49	12 Φ 12	Φ 8 @ 190 C/C
24	14	CONICAL	1.625	0.110	34.67	12 Φ 12	Φ 8 @ 190 C/C
25	15	CONICAL	1.800	0.140	35.54	12 Φ 12	Φ 8 @ 190 C/C
26	16	CONICAL	2.420	0.144	48.19	16 Φ 12	Φ 8 @ 190 C/C

K-RIDE

42. LOOP-IN-LOOP-OUT BOX OUTDOOR TYPE FOR LIGHTING POLES.

BOX: Made from thermo plastic, polystyrene which should be shock proof, safe, IP65 (Weather proof), rust proof, dust proof, water proof having internally embedded gasket with provision for cable entry through IP 65 Thermoplastic, polyamide glands and /or grommets ideal for outdoor application.

Cable Entry: This is through 3 Holes with grommets at equal distances provided below the box suitable for 16sq mm cable, Provision should be made for Light fittings wires to run through the channel behind the box.

Fixing: 5mm Thick M.S. strip 2 Nos for pole mounting should be provided within the box with suitable holes to avoid rusting of MS strip.

Box size (Minimum): 200 (H) x 200 (W) x 98 (D) mm, Wall Thickness of box = 3mm.

Accessories:

- (1) Fuse cut out 20 Amps-1 No,
- (2) 32 Amps 6-way terminal block-1No,
- (3) 16 Amps neutral Link

Properties of Box Material: Thermoplastic, polystyrene

- Non-rusting/non-corrosive
- Shockproof/ non-reactive to weather changes.
- Non-sparking, /Resistant to propagation of fire.

43. 11/0.433KV, CLASS DISTRIBUTION TRANSFORMERS OF RATING 250/100/63KVA

The Distribution transformer of rating 11/0.433 kV, 250/100/63kVA supplied shall comply with IS-1180 (Part-1): 2014.

44. SPECIFICATION FOR HDPE PIPE

The HDPE pipe material should be confirming to standard IS 4984-1995 or latest and should be of PE-80 material designation which has MRS (Minimum Required Strength) of 8.0MPa and maximum allowable hydrostatic design stress of 6.3 MPa (@20 °C) with pressure rating of PN-6(6kg/cm²), heavy gauge has to be provided. The cable has to be laid through HDPE pipe with all necessary accessories for jointing, clamping, bends etc as per site condition has to be provided.

45. LED SIGNAGE BOARD

45.1 Specification For LED Based Name Boards:

NOTE:

- The contractor has to make his own arrangements for transportation of men & material at site. Contractor is advised to visit the sites to have information about the scope of the work to be executed before submitting the offer.
- The exact name & spelling in all languages is tentative and successful tenderer should take approval for spelling in all 3 languages and design before starting the work.
- The LED luminaries should confirm with CEE/SWR specification No. SWR/LED Light fitting (Indoor/ Outdoor)/ 001-2016 Dt. 18.04.2016.
- Design LED name board to be submitted before starting of the work & written approval should be obtained before supply of material.
- The LED name board should be provided for fixed type name and not for scrolling type.
- The letters along with LED will be fixed on 4mm thick aluminium composite panel sheet of 9-10 feet height (minimum) and entire frame shall be supported on MS angle frame from the back side to withstand wind pressure. The successful tenderer shall submit a detailed drawing of the structure and boards for approval of AGM/K-RIDE before manufacturing.

45.2 SPECIFICATION:

Sl. No	Parameter	Description
1	No. of LED's	As per requirements
2	Frame type	Heavy quality aluminium rectangle tubes of 25mm x 50mm with minimum 1mm thickness and front cover of 4mm thick ACP sheet.
3	Physical dimensions for acrylic sheet	As per the letter requirement
4	Thickness of acrylic sheet	3.00 mm with 0.40 grade
5	Language	Kannada, Hindi, English
6	Wattage per letter	15-22 watts (approx.), each LED wattage =3 Smd 1.8 Watt (minimum), white LED and the spacing between adjacent LED modules must not be more than 20-25 mm.
7	LED control	Current Regulator

Section:8B Technical Specifications

8	Viewing angle	120 Deg (Minimum)
9	Nominal Voltage	220 V AC
10	Operating Voltage	105 V to 295 V AC, 50 Hz
11	Protection	As per CEE/SWR specification No. SWR/LED Light fitting (Indoor/ Outdoor)/001-2016 Dt 18.04.2016.
12	Height of letter	2 feet
13	Letters Colour	Kannada – Saffron, Hindi – White & English -Green
14	Approved sources of LED	As per CEE/SWR specification No. SWR/spec/LED dated.12.06.2015.
15	Warranty	5 years total fitting

45.3 DETAILS:

- Each letter box should be made of aluminum, Acrylic and PVC trim cap.
- Back and sides of letter box should be of 65mm (minimum) raising (height) and made with 18-gauge 0.80 microns grade aluminum sheet with MRF or similar powder coating on the Aluminum sheet.
- 2mm (minimum) thick PVC trim cap on top of Aluminum raising sheet.
- Front face should be with Marga cipta or similar make 3mm thick 0.40 grade acrylic sheet in Saffron, white & green colour for each language.
- Aluminum box back side should be with machine slotted and riveted.
- The ACP Sheet of 4mm thick (0.5 mm Front & back aluminum) with approved colour with heavy quality rectangular aluminum tubes of 25mm x 50mm x 1mm frame on the MS angle structure for fixing ACP sheet.
- The structure to be built with proper support to with stand wind pressure and to hold 9-10 feet height (minimum) ACP sheet with frame as per requirement to fix the letters with MS structure with Red oxide initial coat & BLACK Paint with suitable channels as per site condition. (Structure drawing to be approved before starting the work).

Tenderers are requested to visit site to get further information regarding requirement of structure.

- Led should be water proof 3 Nos SMD white colour LED as per CEE/SWR specification No. SWR/LED Light fitting (Indoor/ Outdoor)/001-2016 Dt 18.04.2016.
- The number of power supplies should be based on total wattage of name board and each driver should drive only 90% of its capacity maximum.
- Separate timer along with the proper capacity contactor to be provided inside LED driver box for automatic switching ON & OFF of name board.
- The cost is inclusive of power supply drivers as per requirement and timer with contactor.

45.4 Operating Conditions:

The equipment shall be sturdy and suitable for the following service conditions to be normally met in service:

The dust content in air may be as high as 1.6mg/m³. During dry weather, the atmosphere is likely to be full of dirt and dust. The equipment shall be designed to work in corrosive atmosphere.

In industrial areas, there may be airborne contaminants like smoke and chemical vapours and conducting particles.

45.5 Specification of LED for fitted with fire resistance silicon base board:

- a) White SMD LED Module of uniform intensity and luminosity shall be used for excellent visibility. The intensity of the illumination shall be such that it should be possible to read the letters clearly from a distance of 200 meters or more.
- b) All system units should be modular, such that any module (i.e., LED modules, connector, cable, power supply unit etc.) can be easily removed when defective and a fresh module can be fixed to make the system functional again.

45.6 Power Supply Unit:

- a) All power supply units supplied shall be switch mode power supply (SMPS) type operated from AC source in the voltage range 105-295 V AC, 50 HZ AC (minimum) and single phase.
- b) Over voltage and short circuit protection is incorporated within the power supply.

Summary details of each power supply:

Power supply Switched Mode Power Supply

Rated Working Voltage 220V AC, 50Hz

Working voltage range 105V – 295 V AC

Output 400W (Minimum)

Power Factor > 0.95

45.7 General Requirements:

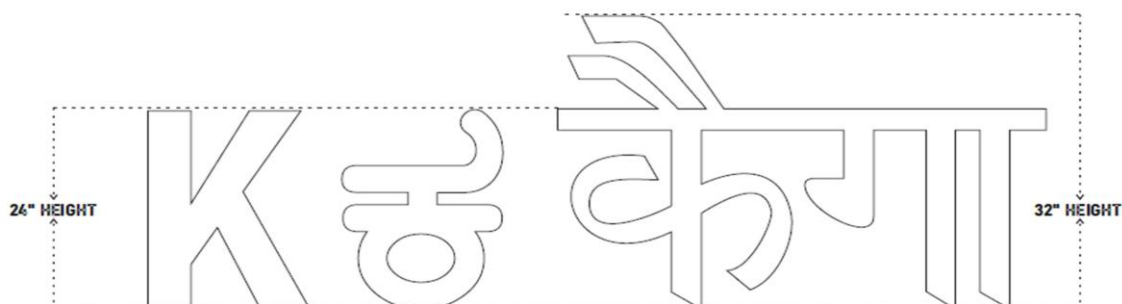
- a) The unit shall be suitable for mounting/hanging and shall be specially designed for protection against dust specification.
- b) The unit should be compact and robust.
- c) The unit should have protected against open circuit & short circuit for the cables and circuits used. The design shall be modular, so that only the defective part need be replaced.

Probable Makes:

Sl.NO	Description of item	Tentative approved makes
1	PVC copper wire	Polycab, Finolex, Havells, KEl, V-Guard, Anchor, Sbee, Universal, Indo Asian

SIGNAGE SPECIFICATIONS FOR ALUMINIUM LED LIT LETTER

- 4mm THICK ALUMINIUM COMPOSITE PANEL
- ANODISED ALUMINIUM BODY RAISING BOX CHANNEL LETTER WITH POWDER COATING
- FRONT FASCIA 3mm THICK MARGA CIPTA 0.40 ACRYLIC
- 2mm THICK IMPORTED 20MM HEIGHT TRIM CAP

**46. CABLE TRAYS:**

Cable trays, of sizes as per schedule of quantities and drawings shall be of perforated doubled bend channel or of ladder design as specified in BOQ. Cable trays shall be fabricated from sheet steel of thickness as per BOQ and shall be complete with tees, elbows, risers, and all necessary hardware

Trays shall be hot dip galvanized and all the accessories shall be factory fabricated, site fabricated accessories are not permitted Cable trays shall be erected in perfect level and plumb and shall comply with the following:

Section:8B Technical Specifications

Trays shall have suitable strength and rigidity to provide proper support for all the contained cables. Trays shall not have sharp edges, burrs or projections injurious to cable insulation. Trays shall include fittings such as bends, risers etc. for changes in direction and elevation. Each run of cable tray shall be completed before laying of cables, Cable trays shall be erected so as to be exposed and accessible.

Cable trays shall be mounted on support structure adequately at interval of 1-meter (Min) distance by means of painted galvanized (as specified) MS structural members secured to the structure by welding. Spacing of the support structure shall be such that the cable trays shall remain perfectly horizontal without buckling when fully loaded with cable runs.

The length of vertical supporting members for horizontal tray runs shall be to suit the number of tray tiers required. Cable trays shall be bolted to the support structure. Minimum clearance between the top most tray tier and the ceiling shall be 300 mm and the next tier shall be at a minimum distance of 250mm. Trays shall be erected properly to present a neat and clean appearance.

This support should be capable of withstanding the entire weight of cable trays and cable contained in the trays. Additional supports are to be provided at both ends of the cable trays and at all bends. The entire cable tray system shall be rigid.

Support structure shall be fabricated from suitable size L Angles/Square Tubes of 6mm thick (Min).

Cables shall be fixed to the tray using proper cable ties, cables shall be dressed properly so as to provide minimum one cable diameter clearance between adjacent cables and from tray ends.

Cable trays shall be earthed by 2 runs of 25 mm x 3 mm GI strips throughout their lengths.

47. CONCRETE:

The detailed cement concrete specification gives information about quality and the quantity of the materials, proportion of mortar, workmanship, method of preparation and execution of work etc. The cement concrete specification is properly prepared which makes it easy on site for execution of cement concrete work.

Coarse Aggregates:

Coarse aggregate shall be of broken stones of granite or similar stones. They shall be free from dust, dirt and other foreign matters. Size of the stones should be 20 mm and down all should be retained on 5 mm square mesh and well graded such that it should not have voids more than 42 %.

Fine Aggregates:

Section:8B Technical Specifications

Fine aggregates shall be of coarse sand and should have hard, sharp and angular grains. The grains should pass the screen of 5 mm square mesh. The sand should be of standard specification and should be free from dust, silt and it should not be obtained from sea. Cement used for the construction should be fresh and it should not be too old. It should be of good quality and should meet all the standard specifications. The minimum compressive strength of cement should be 175 kg/ m².

Water:

Water should be clean and free from alkaline and other acidic matter. It should be suitable for drinking purpose.

Proportion:

M7.5:

The proportion of the cement concrete should be 1:4:8 or as prescribed. For the proportion of 1:4:8 the quantity of materials goes as one part of cement, four parts of sand and eight parts of aggregates.

M10:

The proportion of the cement concrete should be 1:3:6 or as prescribed. For the proportion of 1:3:6 the quantity of materials goes as one part of cement, three parts of sand and six parts of aggregates.

M15:

The proportion of the cement concrete should be 1:2:4 or as prescribed. For the proportion of 1:2:4 the quantity of materials goes as one part of cement, two parts of sand and four parts of aggregates.

M20:

The proportion of the cement concrete should be 1:1.5:3 or as prescribed. For the proportion of 1:1.5:3 the quantity of materials goes as one part of cement, one and half parts of sand and three parts of aggregates.

M25:

The proportion of the cement concrete should be 1:1:2 or as prescribed. For the proportion of 1:1:2 the quantity of materials goes as one part of cement, one part of sand and two parts of aggregates.

Grade of Concrete	Mix of (Cement: Sand: Aggregate)	Size of Coarse Aggregates
M25	1:1:2	20mm
M20	1:1.5:3	20 mm
M15	1:2:4	12.5 mm, 40 mm, 60 mm
M10	1:3:6	20 mm, 40 mm, 60 mm
M7.5	1:4:8	40 mm, 63 mm
M5	1:5:10	40 mm, 63 mm

Section:8B Technical Specifications

Low Grade	1:6:12	40 mm, 63 mm
-----------	--------	--------------

Mixing:

Hand Mixing:

Hand mixing is done on masonry platform or iron sheet tray. For the proportion of 1:2:4 first of all 2 boxes of sand and one bag of cement shall be properly and thoroughly mixed. Then 4 boxes of aggregates are added into the mix and then it is again properly mixed. The mixture should be dry mixed till all the materials are mixed together. Water is then added gradually along with turnings of the mixture. Generally, 25-30 litres of water per bag of cement is used to obtain plastic mix of required workability and water cement ratio.

Machine Mixing:

In machine mixing for the proportion of 1:2:4 first of all 2 boxes of sand are dumped into the cement concrete mixer then one bag of cement and four boxes of aggregates are gradually added and rotated for dry mix to obtain required colour and then required quantity of water is added by water can. While being mixed, generally 25-30 lit of water per bag of cement is used to obtain required workability and water cement ratio.

Curing:

When the concrete gets hardened (generally after 3-5 hours of laying) wet gunny bags are placed on the concrete surface to keep the surface damp till 24 hours. The next day onward the concrete surface is flooded with water for 15 days for proper curing.

48. HIGH MAST

The scope of this work covers Design, manufacture, transport, installation, testing and commissioning of the complete lighting system, using Raising and Lowering type of High mast Towers the Civil Foundation Works shall be paid separately and arrangements with contactor and timer for operation of flood light fittings during all night & part night. All items required for the safe and efficient operation and maintenance of the lighting system, including the high mast, whether explicitly stated or not shall be made by The Contractor.

48.1 Applicable standards:

The following shall be the Reference Standards for the loading of the High mast:

Code No.	Title
a. L.S. 875 (Part III)1987	Code and practice for design loads for structures
b. BSEN 10025	Grades of MS Plates
c. BS.ISO 1461	Galvanizing
d. TR No.7 2000 of IL.E. UK.	Specification for mast and foundation

48.2 Design of mast structure:

The mast shall be capable of withstanding the wind pressure existing in Bangalore division/ area under worst condition.

Design shall be based on dynamic condition resulting from the maximum wind pressure.

Dynamic Loading for the Mast:

The mast structure shall be suitable to sustain an assumed maximum reaction arising from a wind speed as per IS 875 (three second gust), and shall be measured at a height of 10 meters above ground level. The design life of the mast shall be 25 years

Construction of mast:

The mast shall preferably be manufactured from mild steel / BSEN 10025/ DIN 17100 / FE to form a multifaceted continuously tapered profile and shall be delivered in multiple sections of effective length 10metres. The mast shall be 16/20 Meters high and of polygonal construction presenting a good visual appearance Thus a 16/20 M mast in 2 sections to site. Weight of Mass shall be not less than 910Kg. Weight of Lantern Carriage shall not be less than 200 Kgs.

Each section shall be fabricated out of single plate duly folded and welded. There shall be only one longitudinal seam weld per section. Sections with more than one weld, circumferential or longitudinal, shall not be accepted. At site the sections shall be joined together by slip-stressed-fit method and joining shall be done with stressing equipment, thus conforming a sleeve joint. No site welding or bolted joint shall be done on the minimum top diameter shall be 150mm. The overlap distance shall have full penetration of longitudinal welds.

Bottom diameter and plate thickness shall be as per the structural requirements.

The mast shall be hot dip galvanized both internally and externally having a uniform thickness with average of 70 microns and two coat of aluminum marine paint. The life of the mast shall not be less than 25 years.

The procedural weld geometry and the workmanship shall be exhaustively tested by Radiography on the completed welds and certificates submitted.

The dimensions of the mast shall be decided based on proper design and design calculations shall be submitted for verification.

The offered mast shall be rigorously tested under “Wind tunnel testing” to ensure safety of the structure. The testing method, factors taken and norms applied shall be furnished along with the offer.

48.3 Base flange of mast:

The mast shall be provided with fully penetrated base flange which shall be free from any lamination or incursion. The welded connection of the base flange shall be fully developed to the strength of the entire section.

Section:8B Technical Specifications

The base flange shall be provided with supplementary environmental protection of the mast, the entire fabricated mast shall be hot dip galvanized, internally and externally, having a uniform average thickness of 85 microns for plates with more than 5mm thickness and 70 microns for 5mm or less. Galvanizing shall be done in single dipping method for better adhesion and life. Minimum Base Dimension shall be 410 mm for 16 Mtrs and 460 mm for 20 Mtrs High Mast.

48.4 Base compartments:

Door Opening:

An adequate door opening shall be provided at the base of the mast and the opening shall be such that it permits clear access to equipment like winches, cables, plug and socket etc. and also facilitate easy removal of the winch. The door opening shall be complete with a close fitting, vandal resistant, weatherproof door, provided with a heavy-duty double internal lock with special paddle key.

The door opening shall be carefully designed and reinforced with welded steel section, so that the mast section at the base shall be unaffected and undue buckling of the cut portion is prevented. Size of door opening shall not be more than 1200 x 250 mm to avoid buckling of the mast section under heavy wind conditions.

48.5 Head Frame:

The Head Frame which is to be designed as a capping unit of the mast, shall be of welded steel construction, galvanized both internally and externally after assembly. The top pulley shall be of appropriate diameter, large enough to accommodate the stainless-steel wire ropes and the multi-core electric cable. The pulley block shall be made of non-corrodable material, and shall be of die cast Aluminum Alloy (LM-6). Pulley made of synthetic materials such as Plastic or PVC are not acceptable. Self-lubricating bearings and stainless-steel shaft shall be provided to facilitate smooth and maintenance free operation for a long period. The pulley assembly shall be fully protected by a canopy galvanized internally and externally.

Close fitting guides and sleeves shall be provided to ensure that the ropes and cables do not dislodge from their respective positions in the grooves. The head frame shall be provided with guides and stops with PVC buffer for docking the lantern carriage.

48.6 Lantern Carriage:

The fabricated Lantern Carriage shall be provided for holding the flood light fittings and control gear boxes.

Lantern Carriage shall be of special design and of durable steel tube construction to act as conduits with cable holes fully protected by grommets.

It shall be designed to hold required Nos. of flood light fittings and the control gear boxes and lanterns and also have a perfect self-balance

It shall be provided with cast Aluminum junction box and mounting plates.

Section:8B Technical Specifications

It shall be fabricated in two halves and joined by bolted flanges with stainless steel bolts and nyloc/stainless steel nuts to enable easy installation / removal from the erected mast during maintenance.

The inner lining of the carriage shall be provided with the raising and lowering operation of the carriage

This assembly shall not touch the lower surface of the mast.

It shall be so installed that it does not cause any damage to the surface of the mast and is provided with protection buffer arrangement.

It shall be hot dip galvanized after fabrication.

Raising and Lowering mechanism:

For the installation and maintenance of the luminaires and lamps, it will be necessary to lower and raise the Lantern Carriage Assembly. To enable this, a suitable Winch arrangement shall be provided, with the winch fixed at the base of the mast and the specially designed head frame assembly at the top.

48.7 Winch arrangements:

For easy raising and lowering of lantern carriage assembly a suitable Winch Arrangement shall be provided in the base of the mast complete with top pulley, Winch, Stainless steel wire ropes and Winch driving power tool.

The winch shall be of completely self-sustaining type without the need for brakes, springs or clutches so as to eliminate any requirement of adjustment or possibility of being affected by moisture or lubrication. Each driving spindle of the winch shall be positively locked when not in use, gravity activated PAWLS, operating speed, safe working load, recommended lubrication and serial number of the winch shall be clearly marked on each winch.

The winch shall be provided with water proof canopy.

The capacity, operating speed and the dimensions of the drum length and the recommended lubrication etc. shall be clearly marked on the winch.

It shall be capable to operate the winch by hand or by an integral power tool. Integral power tool with worm type gear is not acceptable.

A test certificates shall be furnished along with the winch for maximum load operated and for safety operation at full load.

The winch shall be certified for its capacity to handle a maximum load of required Nos. of flood light fittings as per the Schedule.

48.8 Top pulley assembly:

The pulley assembly shall be complete with Self-lubricating bearings and stainless-steel spindle

Section:8B Technical Specifications

Suitable arrangements shall be made in pulleys such that the electric cables and the stainless-steel ropes are separated before passing over their respective pulleys.

The sleeve pulley arrangement shall be provided with axially and adjustable guides and stops shall be provided for docking the lantern carriage.

The pulley assembly shall be protected by a Aluminum painted canopy.

An external divider shall be provided on the pulley to separate stainless wire ropes and cables so that chances of wrapping together of the ropes and the cables in wound condition or when the lantern are in lowered position can be prevented.

48.9 Stainless Steel Wire Ropes:

The suspension system shall essentially be without any intermediate joint and shall consist of only non-corrodable stainless steel of AISI 304 grade of suitable size with factor of safety of 1:10. The load bearing capacity and factor of safety adapted has to be indicated.

The stainless-steel wire ropes shall be of 7/19 construction, the central core being of the same material. The overall diameter of the rope shall not be less than 6mm. The breaking load of each rope shall not be less than 2350KN for 16 Mtrs and 3400KN for 20 Mtrs mast. Giving a factor of safety of over 5 for the system at full load as per the TR-7 referred to in the beginning of this specification. The end constructions of ropes to the winch drum shall be fitted with talurit. The thimbles shall be secured on ropes by compression splices. Two continuous lengths of stainless-steel wire ropes shall be used in the system and no intermediate joints are acceptable in view of the required safety. No intermediate joints/terminations, either bolted or else, shall be provided on the wire ropes between winch and lantern carriage.

48.10 Cable Connections:

The cable connections shall be made by suitable flexible power cables of appropriate size and rating.

The base compartment of the high mast shall have a terminal box for terminating the incoming cable.

Provision shall be made for electric supply at the base compartment to enable operation of power tool for raising and lowering of the lantern carriage assembly.

The trailing cables of the lantern carriage rings shall be terminated by means of metal cased plug and socket provided in the base compartment to enable flexibility.

Also, suitable provision shall be made at the base compartment of the mast to facilitate the operation of internally mounted, electrically operated power tool for raising and lowering of the lantern carriage assembly. The trailing cables of the lantern carriage rings shall be in the base compartment to enable easy disconnection when required.

48.11 Power drive:

Power Tool for the Winch:

Section:8B Technical Specifications

A suitable high-powered, electrically driven internally mounted power tool, with manual over ride shall be supplied for the rising and lowering of the lantern carriage for maintenance purpose. The speed of the power tool shall be to suit the system. The power tool shall be single speed, provided with a motor of the required rating. The power tool shall be supplied complete with suitable control. The capacity and lifting of the electric motor used in the power tool shall be suitable for the lifting of the design load installed on the lantern carriage.

The power tool mounting shall be so designed that it will be not only self-supporting but also aligns the power tool perfectly with respect to the winch spindle during the operations. Also, a handle for the manual operation of the winches in case of problems with the electrically operated tool, shall be provided and shall incorporate a torque limiting device. The power tool operation shall always be through a separate torque-limiting device to protect the wire ropes from over stretching. It shall be mechanical with suitable load adjusting device. The torque limiter shall trip the load when it exceeds the adjusted limits. There shall be suitable provision for warning the operator once the load is tripped off. The torque limiter is a requirement as per the relevant standards in view of the overall safety of the system. Each mast shall have its own power tool motor.

The single speed electric power drive shall be provided with reversible motor suitable for 400/230V operation.

The power drive shall be connected to the winch via matching coupler. To protect the hoist rope system against over load the coupler shall incorporate a torque limiting clutch preset at the factory.

48.12 Winch winding and adjustable handle

For manual operation of the winch drum and for minor adjustment of the lantern carriage suitable handles shall be supplied.

48.13 Lightning finial

One number heavy duty hot dip galvanized lighting finial shall be provided for each mast. The lightning finial shall be minimum 1.2M in length and shall be provided at the center of the head frame. It shall be bolted solidly to the head frame to get a direct conducting path to the earth through the mast. The lighting finial shall not be provided on the lantern carriage under any circumstances in view of safety of the system.

48.14 Aviation obstruction lights:

Suitable Aviation Obstruction Lights of reliable design and reputed manufacturer shall be provided on the top of each mast.

48.15 Luminaires

Luminaires shall be specially designed with cast aluminum housing suitable for housing the lamp and control gears for the lamps. The luminaires shall be tested as per Indian standards and test reports shall be submitted along with the materials. The luminaires shall be suitable for installation on high masts. The specification of luminaire shall meet CEE/SWR specification No. SWR/LED Light fitting (Indoor/Outdoor)/001-2016 Dt.18.04.2016

48.16 Timer db

Section:8B Technical Specifications

Supply and installation of Digital Timer DB 32A with suitable incoming and outgoing MCBs, timer switch, contactor for automatic ON/OFF of the above light fittings at a preset time, housed in water proof cabinet including cost of all materials, labour charges complete including all accessories as per specification

Note:

Work shall be carried out under close supervision of Engineer of KRIDE, Bengaluru.
2 sets of sample wiring materials shall be submitted to AGM/K-RIDE for approval before fabrication/commencement of work

Person (Contractor or his representative) who possesses a competency certificate from the EI shall supervise the work.

All the materials wherever applicable shall be of ISI marked.

No joint in the wiring is permitted. If any jointing is found subsequently, a penalty of Rs. 500/- for each joint will be deducted from the bills and also the contractor has to redo the portion.

The light fitting points have to be provided according to site condition and as per instructions of Engineer-in-charge.

48.17 Foundation:

The High mast shall be erected on foundation with the details appended in the below drawing

The size of footing shall be 2600mm x 2600mm for 16Mtr High Mast and 3000mm x 3000mm for 20 Mtr High mast

The other dimensions and calculations are as appended in the HIGH MAST bar bending details given below

PCC foundation in 1:4:8 mix of size

RCC foundation in 1:1:2 mix of size

Steel reinforcement to the foundation shall be provided as appended in the drawing.

75 mm dia PVC pipe shall be provided for cable entry while casting the foundation.

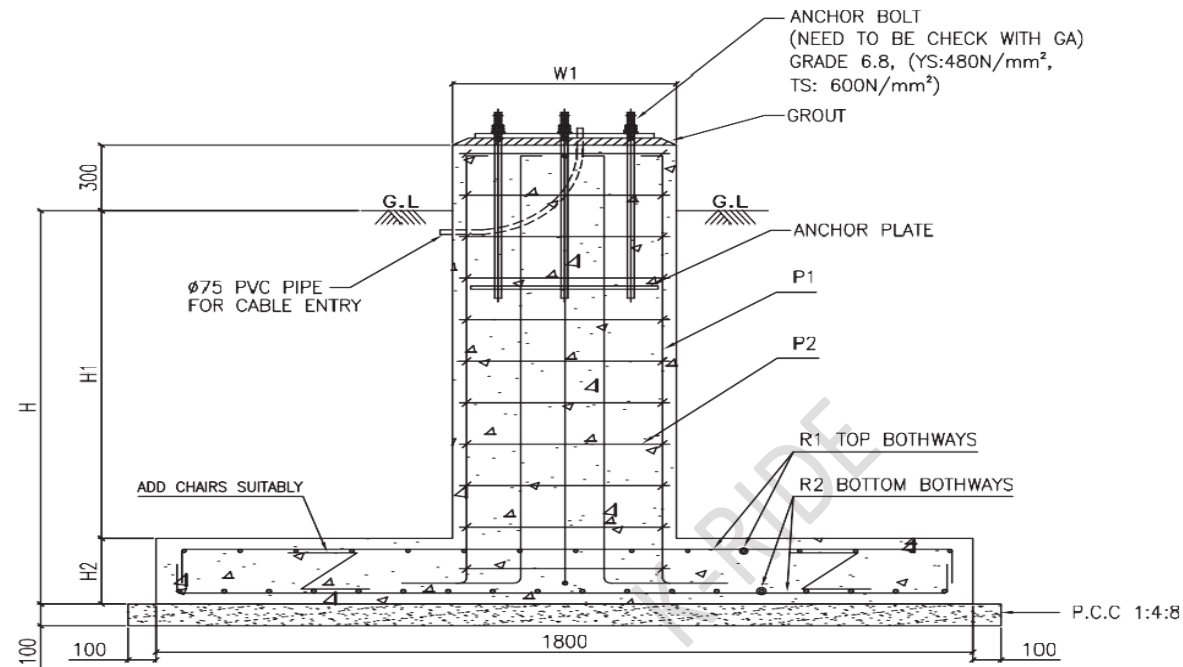
Section:8B Technical Specifications

TECHNICAL DATA FOR HIGH MAST	12 Mtr/12.5Mtr	16Mtr	20Mtr	25Mtr	30Mtr
Base dia. and top diameter (A/F)	Base - 310 mm, Top - 100 mm	Base - 410 mm, Top - 150 mm	Base - 460 mm, Top - 150 mm	Base - 540 mm, Top - 200 mm	Base - 610 mm, Top - 150 mm
Plate thickness	3 mm	Bottom - 4 mm, Top - 3mm	Bottom - 4 mm , Top - 3 mm	Bottom - 5 mm, Middle - 4mm, Top - 3 mm	Bottom - 5 mm , Middle - 4mm, Top - 4 mm
Cross section of Mast	12-sided polygon.	20-sided polygon.	20 sided polygon.	20 sided polygon.	20 sided polygon.
Diameter of base plate	460 mm	570 mm	670 mm	730 mm	840 mm
Thickness of base plate	20 mm	25 mm	25 mm	30 mm	30 mm
Lightning protection finial	G.I single spike of length 1200 mm	G.I single spike of length 1200 mm	G.I single spike of length 1200 mm	G.I single spike of length 1200 mm	G.I single spike of length 1200 mm
Number of foundation bolts	6 nos.	8 nos.	8 nos.	12 nos.	12 nos.
PCD of foundation bolts	385 mm	490 mm	490 mm	640 mm	640 mm
Type / diameter / length of foundation bolts	TS600 / 24 mm dia / 750 mm long	TS600 / 24 mm dia / 850 mm long	TS600 / 30 mm dia / 750 mm long	TS600 / 30 mm dia / 850 mm long	TS600 / 30 mm dia / 850 mm long
LANTERN CARRIAGE					
Material of construction	50 OD ERW Class B - M. S. Pipe	60 OD ERW Class B - M. S. Pipe	60 OD ERW Class B - M. S. Pipe	60 OD ERW Class B - M. S. Pipe	60 OD ERW Class B - M. S. Pipe
Load carrying capacity	6 Luminaires	12 Luminaires	12 Luminaires	16 Luminaires	12 Luminaires
TRAILING CABLE					
Conductor	Copper, 5 core, 2.5 sq mm	Copper, 5 core, 4 sq mm	Copper, 5 core, 4 sq mm	Copper, 8 core, 2.5 sq mm	Copper, 5 core, 4 sq mm
Insulation /Sheathed	PVC insulated & PVC sheathed	EPR insulated & PCP sheathed	EPR insulated & PCP sheathed	EPR insulated & PCP sheathed	EPR insulated & PCP sheathed
No. of cables / circuits per mast	One	One	One	One	One

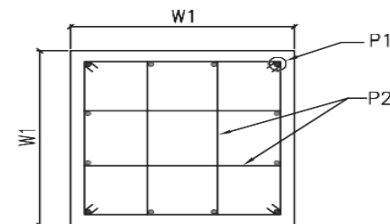
Section:8B Technical Specifications

TECHNICAL DATA FOR HIGH MAST	12 Mtr/12.5Mtr	16Mtr	20Mtr	25Mtr	30Mtr
WINCH / POWER TOOL					
Type / SWL of wncn	Double Drum / 350 Kg	Double Drum / 500 Kg	Double Drum / 750 Kg	Double Drum / 750 Kg	Double Drum / 750 Kg
Method of operation	Motorised / Manual	Motorised/Manual	Motorised/Manual	Motorised/Manual	Motorised/Manual
Motor capacity	0.5 HP	1 HP	1 HP	1.5 HP	1.5 HP
No of speeds	Single speed	Single speed	Single speed	Single speed	Single speed
STAINLESS STEEL WIRE ROPE					
Breaking load capacity	1450 KN	2350 KN	3400 KN	3400 KN	3400 KN

Section:8B Technical Specifications



SECTIONAL ELEVATION



DETAIL OF PEDESTAL

NOTES:

1. ALL DIMENSIONS ARE IN 'MM' UNLESS OTHERWISE SPECIFIED.
2. MATERIAL AND CONSTRUCTION TO BE IN ACCORDANCE WITH IS: 456.
3. THE CONCRETE GRADE FOR FOUNDATION AND OTHER WORKS SHALL BE OF MIX M25 U.N.O.
4. REINFORCEMENT SHALL BE OF HIGH YIELD STRENGTH DEFORMED BARS COMPLYING WITH IS:1786-1985.
5. CLEAR COVER IS 50MM TO MAIN REINFORCEMENT AT END OF MAIN BARS
6. DEVELOPMENT LENGTH FOR TENSION LDT=50 TIMES THE DIA OF BAR.
7. FOR ANY OTHER DETAILS CLAUSES OF IS-456, SP-34, SP-16 AND SP-23 SHALL BE REFERRED.
8. IT IS ASSUMED THAT SOIL TYPE IS SANDY SOIL WITH CLAY CONTENT 5-10% WITHOUT WATER TABLE, IF ANY CHANGE APPROACH VALMONT FOR REVISED DESIGN DRAWING.
 - 8.1 THE SOIL BEARING CAPACITY IS 10.0 T/m²
 - 8.2 ANGLE OF REPOSE 0 DEG
 - 8.3 DENSITY OF SOIL 1.44 T/m³

Section:8B Technical Specifications

SR. NO.	HEIGHT (M)	POLYGON	LUMINARIES	RCC (M)	PCC (M)	STEEL (Kg.)	SIZE OF PEDESTAL W1xW1) (mm X mm	PEDESTAL REINFORCEMENT		SIZE OF FOOTING (WXW) (mm X mm)	DEPTH OF FOOTING			RAFT REINFORCEMENT	
								MAIN BAR P1	STIRRUPS P2		H (mm)	H1 (mm)	H2 (mm)	BOTTOM REINF. BOTH SIDE R1	TOP REINF. BOTH SIDE R2
1	12	12 SIDED	6 LUM.	2.19	0.58	99	700 X 700	12 12	6 @ 190 C/C	2200 X 2200	1500	1200	300	10 @ 250C/C	10 @ 250C/C
2	12.5	12 SIDED	6 LUM.	2.32	0.63	101	700 X 700	12 Φ 12	6 @ 190 C/C	2300 X 2300	1500	1200	300	Φ 10 @ 250C/C	Φ 10 @ 250C/C
3	16	20 SIDED	8 LUM.	2.87	0.78	125	750 X 750	12 Φ 16	6 @ 190 C/C	2600 X 2600	1500	1200	300	Φ 10 @ 250C/C	Φ 10 @ 250C/C
4	16	20 SIDED	12 LUM.	3.31	0.90	148	800 X 800	12 Φ 16	6 @ 190 C/C	2800 X 2800	1500	1200	300	Φ 10 @ 220C/C	Φ 10 @ 250C/C
5	20	20 SIDED	8 LUM.	3.85	1.02	186	800 X 800	12 Φ 16	6 @ 190 C/C	3000 X 3000	1800	1500	300	Φ 10 @ 170C/C	Φ 10 @ 250C/C
6	20	20 SIDED	12 LUM.	4.16	1.02	192	900 X 900	12 Φ 20	6 @ 190 C/C	3000 X 3000	1800	1500	300	Φ 10 @ 180C/C	Φ 10 @ 250C/C
7	25	20 SIDED	12 LUM.	5.71	1.37	266	900 X 900	12 Φ 20	6 @ 190 C/C	3500 X 3500	1800	1450	350	Φ 12 @ 200C/C	Φ 10 @ 220C/C
8	25	20 SIDED	16 LUM.	6.80	1.60	335	1000 X 1000	12 Φ 24	6 @ 190 C/C	3800 X 3800	1800	1450	350	Φ 12 @ 170C/C	Φ 10 @ 220C/C
9	30	20 SIDED	12 LUM.	7.72	1.76	389	1100 X 1100	12 Φ 32	6 @ 190 C/C	4000 X 4000	1800	1450	350	Φ 12 @ 160C/C	Φ 10 @ 230C/C
10	30	20 SIDED	16 LUM.	9.02	1.85	449	1100 X 1100	12 32	6 @ 190 C/C	4100 X 4100	2000	1600	400	12 @ 150C/C	10 @ 190C/C

49. L.T. DISTRIBUTION BOX FOR 63 / 100/250 KVA 11/0.44 KV TRANSFORMER (3 PHASE, 200A)

49.1 SCOPE:

The scope of this specification is for design, manufacture, testing and supply of outdoor type L.T. distribution boxes suitable for operation on 433 volts, 3 phase, four wires AC, 50 Hz system and required to be installed at the secondary terminals of distribution Transformer centers of 100KVA and 250KVA & above.

49.2 COMPONENTS:

The L.T. Distribution boxes shall comprise of the following components.

1. Enclosures fabricated out of M.S. sheet
2. Bus Bars
3. Moulded case circuit breakers.

49.3 APPLICABLE STANDARDS:

The L.T. Distribution Boxes with its components shall conform to the following standards of Bureau of Indian Standard (IS) and International Electro Technical Commission (IEC).

- | | |
|------------------|--|
| 4. IS-5 | Ready mixed paints. |
| 5. IS-104 | Ready Mixed paints, Brushing and zinc chroming |
| 6. IS-117 | Paints finishing exterior. |
| 7. IS- 440 | Chemical analysis of copper: - |
| 8. IS-1079 | Hot rolled carbon steel. |
| 9. IS-1730 | Steel sheet and strip dimensions. |
| 10. IS-13947 | Parts I & II Circuit breakers. |
| 11. IS-6639 | Hexagonal Bolts for steel structures. |
| 12. IS-8828 1996 | MCCB's for voltages not exceeding 1000V. |

49.4 NORMAL SERVICE CONDITIONS:

Generally, as per IS -13947 - Part I & II with latest amendments thereon.

49.5 DEFINITION & TERMINOLOGY - As per

- i) IEC-56 Clause (3) and sub- clause thereof for circuit breakers.
- ii) As per IS-13947 Part I & II thereof for circuit breakers.

49.6 DESIGN & CONSTRUCTION:

The enclosure shall be fabricated out of 2mm MS Sheet. The doors shall be provided with spring loaded latch operated by common key for all boxes. Hinges shall be provided at a distance of 150mm from the top and bottom of the distribution box for easy swinging. Doors shall be of non-removable type. The design shall be such that the boxes are water tight, dust and vermin proof. U- type drains shall be provided on the top and sides of drain away rainwater. Four angles of ventilating louvres with perforated sheet weld mesh shall be provided on both the doors for each box. Two earthing terminals one on either side of the box, legibly identified and marked shall be provided.

A general arrangement drawing of L T Distribution boxes, suitable for 100KVA and 250/300KVA Distribution Transformers is enclosed.

49.7 BUS BARS:

49.7.1 The Bus bars shall be of Aluminium flat and provided with PVC/heat shrink insulation with red yellow, blue and green colour code to identify each of the phases and the neutral.

49.7.2 The Bus bar clearances shall be as per drawing enclosed.

49.7.3 The recommended sizes of the main bus bars and vertical riser links shall be as follows:

Capacity of Transformers	Current rating in Amps	Size of Main bus bars in mm	aluminum vertical riser links in mm	Number of circuits (outgoing)
100KVA	240	6 X 40	8 X 20	2
250KVA	630	10 X 50	10 X 30	2

The bus bars shall be arranged in a staggered vertical formation and shall be supported by porcelain insulators.

49.8 MOULDED CASE CIRCUIT BREAKERS (MCCB):

MCCB's shall generally comply with IS-13947 Part-I & II. The design and construction shall be in accordance with IS-8828-1996. The MCCB shall be a compact unit comprising of all the protective circuits. The MCCB's shall be suitable for 100KVA and 250KVA Transformers.

49.9 RATING & CHARACTERISTICS:

Capacity of Transformer	Continuous current	Rated short circuit rating capacity at 0.25 PFkA (rms)	Rated peak making capacity kA (rms)
100KVA	160Amps	50	105
250KVA	250Amps	50	105

- Rated operating voltage 433V phase to Phase
250 V Phase to neutral.
- Rated insulation voltage 660V Minimum
- Category as per IS 13947 -- Part I & II: Icu= Ics= 100%.

Section:8B Technical Specifications

- d) Current Limiting: - The moulded case circuit breakers directly feeding the loads shall be preferably of current limiting type such that under short circuit conditions very low cut off current and are let through for better protection of loads, cables etc.,
- e) Protective Release: - The MCCB's shall be fitted with suitable protective release to give overload short circuit protection. The protective release and the tripping mechanism shall be such that all three poles of the MCCB shall open in case of fault on any one/two or all three poles.
- f) Current Setting: The Current of the MCCB shall be for 100% of the MCCB thermal rating. The setting shall be fixed at 100% setting suitable for momentary rating and compatible with the full load current of the Transformers.

49.10 AMBIENT COMPENSATION:

The current setting or the tripping time shall not be affected by change in ambient conditions. The ambient compensation shall be effective over 0°C to 55°C.

49.11 TIME CURRENT CHARACTERISTICS:

The protective release shall have inverse time current tripping for over load and instantaneous for short circuit.

49.12 MECHANISM:

The MCCB shall have manual closing mechanism, which shall be quick make, quick brake and trip free. The position of the knob shall give indication of 'ON', 'OFF' & 'TRIP'.

Facility for manual tripping shall be provided.

49.13 TERMINATION:

The terminals shall have adequate capacity for termination of Aluminum cables of size up to 3 x 240 Sq mm.

49.14 EARTHING:

The Earthing shall be as per clause 4.5 and sub clause thereof IS 8828 – 1996 with latest revisions etc.

49.15 PAINTING & FINISHING:

The Frame work and surface of steel panels shall be treated with seven tank process to remove rust and scales. The interiors and exteriors shall be powder coated with admiralty grey pure polyester powder with thickness of 60-80 microns.

49.16 TESTS:

Type and Routine Tests on the circuit breaker shall be as per IS-13947 Part I & II and as per IS- 8828 - 1996.

- i) Type tests: As per clause R.1.2 (a), (b) & (c) of IS-8828-1996
- ii) Routine tests: As per IS - 13947 part I & II with latest revisions there on.

49.17 INSPECTION:

In respect of bought out items the manufacturer shall use equipment's/items supplied by standard/reputed manufacturers and furnish manufacturers Test Certificate as well as the

Section:8B Technical Specifications

proof of purchase from these manufacturers (Excise gate pass) for information of the owner. The supplier shall give the owner sufficient advance intimation to arrange for inspection of the LT Distribution Boxes. The owner shall have easy access to the manufacturers works at all reasonable times of the day.

49.18 MARKING & NAME PLATE:

Each outgoing and incoming circuit near the MCCB and the exit shall be dearly marked.

A Caution board of 433V rating shall be affixed on the front of the box.

A name plate incorporating the following shall be provided.

- iii) Manufacturer name and address
- iv) Purchase order reference
- v) Rating of the Distribution Box
- vi) Rating of MCCB used with make and other ratings.

49.19 DESPATCH:

The Supplier shall fabricate one box and offer for approval before commencement of bulk supplies. The Bulk supplies shall commence only after the sample is approved. Further the manual containing operation, maintenance of the equipment/components shall be supplied along with each distribution box.

The fabrication and assembly of equipment shall be strictly in accordance with the approved drawings and no deviations shall be permitted without the written approval of the owner. All the manufacturing and fabrication work in connection with the equipment prior to approval of drawing shall be at contractor's risk.

49.20 PACKING & FORWARDING:

The equipment shall be packed suitably. The contractor is responsible for any damage to the equipment due to improper and inadequate packing. The contractor without any extra cost shall supply any material found short without any extra cost.

50. FEEDER PILLAR BOX

50.1 General

- a) Medium voltage feeder pillar shall be cubicle type, floor mounted, free standing type, dust and vermin proof, totally enclosed, of uniform height and for outdoor utilization and suitable for 3-phase, 4 wire, 415 V, 500 Hz AC, solidly earthed neutral, electric supply system complete with 4 nos. pedestals, accessories, inter-connections, bus bar chamber with copper/aluminium bus bar (as specified in the relevant BOQ item), ON/OFF indication, CTs, switchgears (as specified in the relevant BOQ item), timer etc. in position duly wired up with copper conductor cable with colour coding, etc. and other accessories though not mentioned here but necessary to complete the equipment in all respects.
- b) The manufacturer shall have ISO: 9001 certification with testing arrangement and powder coating facilities in the works.

Section:8B Technical Specifications

50.2 Digital Time switch (Timer) of suitable rating and contactors (as specified in the relevant BOQ item) shall be provided in the feeder pillar to operate pump/street lights etc. and this shall be controlled with independent switchgear/s.

50.3 Construction

50.3.1 The feeder Pillar shall be fabricated from 2.0 mm thick CRCA sheet steel. The shroud & partitions shall be of minimum 1.6 mm thickness and shall be fabricated from CRCA sheetsteel. The feeder pillar shall be powder coated in approved shade by seven tank process. The degree of protection shall not be less than IP 54 as per IS: 13942/Pt.1.

50.3.2 Pedestals and base frame shall be of MS angle of 75mm x 75mmx 8 mm (nominal size). The Feeder Pillar shall have the provision of flush doors on front and back in two equal parts with hinges and concealed lock openable with special key.

50.3.3 The following minimum clearances shall be maintained:

- | | | |
|------|--------------------------|---------|
| i) | Between Phases | - 32 mm |
| ii) | Between Phases & Neutral | - 26 mm |
| iii) | Between Phases & Earth | - 26 mm |
| iv) | Between Neutral & Earth | - 26 mm |

50.3.4 All functional units shall be arranged in multi-tier formation & each such unit shall be fully compartmentalized. Vertical cable alley shall be provided. Each compartment shall have its own individual door with concealed hinges & the door shall have interlocking so that it can only be opened after switching off the module.

50.4 Bus Bars

50.4.1 The bus bars shall be made of high conductivity aluminium/copper (as specified in BOQ) conforming to the requirement of IS 5082/1998 for aluminium and IS: 1897/1983 for copper. The bus bars shall have uniform cross section (basis of bus bar cross section will be maximum of 1000 A/sq. inch for copper and 630A/sq. inch for aluminium). The cross-section of the neutral bus bar shall be same as that of the phase bus bar for bus bars of capacity upto 200 Amp. For higher capacities, the neutral bus bar shall not be less than half (50 %) the cross-section of that of the phase bus bars.

50.4.2 Bus bars shall be supported on suitable non-hygroscopic, non-combustible, material such as DMC/SMC.

50.4.3 Bus bars shall be insulated with PVC tapes/ tubes (heat shrink type) with colour coding (Red/Yellow/Blue/ Black) to withstand the test voltage of 2.5 kV for one minute.

50.5 Moulded Case Circuit Breakers (MCCB)

50.5.1 MCCB shall be TPN of rating as specified in the relevant BOQ item and

Section:8B Technical Specifications

shall conform to IS- 13947/Pt-2/1993 ($I_{cs} = 100\%I_{cu}$ or as specified in relevant BOQ item) with thermal release setting 70/80%-100% or fixed type (as specified in the relevant BOQ item) with breaking capacity of not less than 25 kA for load currents up to 200 amp. & 35 kA for load currents above 200 amp rating. MCCBs shall be suitable for three phase, 415 Volt, AC supply.

50.5.2 Tripping unit shall be of thermal – magnetic type provided in each pole and connected by a common trip bar such that tripping of any one pole operates all the poles and they open simultaneously.

50.6 Fuse Switch/ Switch Fuse Unit

Fuse switch/switch fuse unit shall be heavy duty, TPN double break of rating (as specified in the relevant BOQ item), utilization category AC 23, conforming to IS: 13947/Pt. III/1993 with 3 HRC fuses conforming to relevant IS and one neutral link

50.7 Current Transformers

50.7.1 Current transformers shall be in conformity with IS: 2705 (Part I, II & III). Current transformers shall be rated for 1 kV. Current Transformer shall have rated primary current, rated burden and class of accuracy. The rated secondary current shall be 5 A. The acceptable minimum class of various applications shall be as given below:

Measuring :
Class 1
Protection :
Class 5 P10.

50.7.2 The VA rating of the CTs shall be not less than 5 VA.

50.8 Cable Termination

50.8.1 Cable entries shall be provided with metal glands to prevent damage to the insulation of the cable and terminals shall be provided to suite the number, type and size of aluminium conductor power cables.

50.8.2 Provision shall be made for bottom entry of cables through removable gland plates.

50.9 Tests at Manufacturers' Works

50.9.1 All routine tests shall be carried out in the presence of the inspecting Engineer.

50.9.2 Original test certificates of all equipment's/ instrument shall be submitted by the contractor along with the supply of panel board after the Inspecting Officer passes the feeder pillar.

50.10 SWITCH BOARD

General

- a) Medium voltage switch board shall be cubicle type, floor mounted, free standing type, dust and vermin proof, totally enclosed, of uniform height and for indoor utilization and suitable for 3- phase, 4 wire, 415 V, 50 Hz Ac, solidly earthed neutral, electric supply system complete with accessories, inter connections, bus bar chamber with copper/ aluminium busbar (as specified in the relevant BOQ item), ON/OFF indication, CTs, switchgears (as specified in the relevant BOQ item) timer etc. in position duly wired up with copper conductor cable with colour coding and other accessories though not mentioned here but necessary to complete the equipment in all respects.
- b) The switch board manufacturer shall have ISO: 9001 certification with testing and powder coating facilities in the works.

50.11 Testing and Commissioning at Site

Following tests shall be carried out prior to Commissioning:

- a) Insulation test
- b) Trip Tests & Protection Tests

50.12 Erection

Brick masonry platform of suitable size with 450 mm height (approximate) shall be constructed in the specified location and cement finish. Feeder pillar shall be erected on this platform by grouting of pedestals as approved by the Engineer.

- 50.13 Digital time switch (Timer)** of suitable rating and contactors (as specified relevant BOQ item) shall be provided in the panel to operate pump/street lights etc. and shall be controlled with independent switchgear/s. Construction

The panel shall be fabricated from 2.0 mm thick CRCA sheet steel. The shroud & partitions shall be minimum 1.6 mm thickness and shall be fabricated from CRCA sheet steel. The panel shall be powder coated in approved shade by seven-tank process. The degree of protection shall not be less than IP 42 as per IS: 13942/Pt.1.

The following minimum clearances shall be maintained:

- | | |
|------------------------------|---------|
| i) Between Phases | - 32 mm |
| ii) Between Phases & Neutral | - 26 mm |
| iii) Between Phases & Earth | - 26 mm |
| iv) Between Neutral & Earth | - 26 mm |

All functional units shall be arranged in multi-tier formation & each such unit shall be fully compartmentalized. Vertical cable alley shall be provided. Each compartment shall have its own individual door with concealed hinges & the door shall have interlocking so that it can only be opened after switching off the module.

50.14 Bus Bars

Section:8B Technical Specifications

- 1) The bus bars shall be made of high conductivity aluminium/copper (as specified in BOQ) conforming to the requirement of IS 5082/1998 for aluminium and IS: 1897/1983 for copper. The bus bars shall have uniform cross section (basis of bus bar cross section will be maximum of 1000 A/sq. inch for copper and 630A/sq. inch for aluminium). The cross-section of the neutral bus bar shall be same as that of the phase bus bar for bus bars of capacity upto 200 Amp. For higher capacities, the neutral bus bar shall not be less than half (50 %) the cross-section of that of the phase bus bars.
- 2) Bus bars shall be supported on suitable non-hygrosopic, non- combustible, material such as DMC/SMC Bus bars shall be insulated with PVC tapes/ tubes (heat shrink type) with colour coding (Red/Yellow/Blue/ Black) to withstand the test voltage of 2.5 kV for one minute.

50.15 Molded Case Circuit Breakers (MCCB)

MCCB shall be TPN of rating as specified in the relevant BOQ item and shall conform to IS-13947/Pt-2/1993 ($I_{cs} = 100\% I_{cu}$ or as specified in the relevant BOQ item) with thermal release setting 70/80%-100% or fixed type as specified in the relevant BOQ item) with breaking capacity of not less than 25 kA for load currents up to 200 amp. & 35 kA for load currents above 200-amp rating. MCCBs shall be suitable for three phase, 415 Volt, AC supply.

Tripping unit shall be of thermal – magnetic type provided in each pole and connected by a common trip bar such that tripping of any one pole operates all the poles and they open simultaneously.

50.16 Fuse Switch/ Switch Fuse Unit

Fuse switch/switch fuse unit shall be heavy duty, TPN double break of rating (as specified in the relevant BOQ item), utilization category AC 23, conforming to IS: 13947/Pt. III/1993 with 3 HRC fuses conforming to relevant IS and one neutral link

50.17 Current Transformers

Current transformers shall be in conformity with IS: 2705 (Part I, II & III). Current transformers shall be rated for 1 kV. Current Transformer shall have rated primary current, rated burden and class of accuracy. The rated secondary current shall be 5 A. The acceptable minimum class of various applications shall be as given below:

Measuring: Class 1

Protection: Class 5

P10.

The VA rating of the CTs shall be not less than 5 VA.

50.18 Cable Termination

Cable entries shall be provided with metal glands to prevent damage to the

Section:8B Technical Specifications

insulation of the cable and terminals shall be provided to suite the number, type and size of aluminum conductor power cables.

Provision shall be made from bottom for entry of cables through removable gland plates.

50.19 Tests at Manufacturers' Works

All routine tests shall be carried out in the presence of the inspecting Engineer.

Original test certificates of all equipment's/ instrument shall be submitted by the contractor along with the supply of panel board after the Inspecting Officer passes the feeder pillar.

Testing and Commissioning at Site

Following tests shall be carried out prior to Commissioning:

- 1) Insulation test
- 2) Trip Tests & Protection Tests

TECHNICAL SPECIFICATION FOR 11 KV COMPACT RING MAIN UNITS FOR OUT DOOR USE IN 11 KV UNDERGROUND CABLE SYSTEM

1. SCOPE:

- 1.1 This specification covers the design, manufacture, testing and delivery at site for erection and commissioning of "Compact RMU" to be erected in the underground cable distribution system.
- 1.2 The Compact RMU shall be suitable for main cable network of 800Amps and loop cable network of 800Amps /630Amps and shall consist of the following:
 - (a) Two Load Break Switches with Earthing Switches for incoming and outgoing main loop 11 KV XLPE cables of size 240/400 sq.mm cross section aluminum conductor,
 - (b) One Circuit Breaker with Earthing Switch for connecting Distribution Transformer loop 11 KV XLPE cables of size 95 sq.mm cross section aluminum conductor, and
 - (c) Provision for adding more number of Circuit Breakers of the type mentioned in item (b) above.
- 1.3 These shall comply with the following system parameters:

Section:8B Technical Specifications

1.	Nominal System Voltage:	11 KV
2.	Highest System Voltage:	12 KV
3.	Rated Voltage:	12 KV
4.	System frequency:	50 Hz
5.	Number of Phases:	Three Phase - Three Wire

1.4 The Load Break Switches with Earthing Switches, and the Circuit Breakers with Earth Switches used in the Compact RMU shall be of Vacuum or SF₆ gas filled type meeting the following criteria:

	Lightning Impulse Withstand Voltage Phase - to - Phase & Phase - to - Earth: Across the Isolating distance:	75 KVp 85 KVp
	Power Frequency Withstand Voltage: (1) to earth, between poles and across opening (2) switch device (3) across isolating device	28 KV rms for minute 32 KV rms for 1 minute
	Rated Short Time Breaking Capacity	21 KA for 3 sec
	Rated duration of Short Circuit:	3 seconds
	Rated Normal Current for Circuit Breaker:	200 Amps rms
	Load Break Switches:	
	a) Rated Short Circuit making capacity:	(a) 50 KA peak at rated voltage (both the earth switch and Load Break Switches)
	b) Rated Load Interrupting Current:	800 Amps / 630 A rms
	c) Rated Cable Charging Interrupting current	25 A

- 1.5 The configuration of the Compact RMU shall be generally as per BESCOM. Provision should be made to extend the Compact RMU by installing additional Circuit Breakers of similar design.
- 1.6 All the switchgear shall be capable of withstanding the specified current without any damage being caused, in accordance with the latest versions of IEC 60694 and IS 3427.
- 1.7 Suitable Meter & CT's along with suitable wiring and other accessories shall be provided as per BESCOM Metering specifications / norms.

2. SERVICE CONDITIONS:

- 2.1 The equipment shall be suitable for installation at location having the following climatic conditions:

a	Annual average ambient temperature:	40°C
b	Maximum ambient temperature:	45°C
c	Temperature rise due to solar absorptio	10°C
d	Maximum relative humidity:	95%
e	Annual rainfall:	1000 to 1200 mm
f	Duration of rainy season:	May to October
g	Altitude:	up to 1000 M above MSL
h	Environmental condition:	Exposed to sun and rain by the side of road and subject to dust and Pollution from the heavy vehicular Traffic

3. STANDARDS:

- 3.1 The equipment's and all the components shall meet the requirements of the latest versions of the following standards:
 - (a) IS 3427: AC metal enclosed switchgear and control gear for rated voltages above 1 KV and up to and including 52 KV.
 - (b) IS 12063: Classification of degrees of protection provided by enclosures of electrical equipment.

- (c) IS 9920 (Parts 1 to 4): High Voltage Switches.
- (d) IS 9921 (Parts 1 to 5): Specification for AC disconnectors and earthing switches for voltages above 1000 V
- (e) IS 13118: HV AC Circuit Breakers.
- (f) IS 12729: General requirements of switchgear and control gear for voltages exceeding 1000 V
- (g) IS 10601: Dimensions of terminals of HV Switchgear and Control gear.
- (h) IEC 1330: High voltage/Low voltage prefabricated substations
- (i) IEC 60694: Common clauses for MV switchgear standards.
- (j) IEC 6081: Monitoring and control.
- (k) IS 2705: Current Transformers
- (l) IS 8686: Specification for Static Protective Relays.

4. DESIGN:

- 4.1 The compact RMU shall be designed to operate at the rated voltage of 12 KV. It shall consist of Two numbers of 630 Amps Vacuum or SF6 Insulated Load Break Switches as Incomers and the required numbers of 200 Amps Vacuum or SF6 Circuit Breakers suitable for control of 11 KV Transformer loop circuits consisting of several distribution transformers; total load of which do not exceed 3500 KVA. It shall also include, within the same metal or earth screened cast resin enclosure, earthing switches for each Load Break Switch and Circuit Breaker for earthing each of the devices. Suitable fool-proof interlocks shall be provided to these earthing switches to prevent its inadvertent or accidental closing when the circuit is live and the concerned Load Break Switch/Circuit Breaker is in closed position. The limiting dimensions shall be preferably around 1800-mm width x 1100-mm depth x 1900- mm height for the initial two Load Break Switches and one Circuit Breaker. Suitable width for each addition of the Circuit Breaker is allowed. Provision should be made for extension of few more Circuit Breakers or Load Break Switches on a future date. In case of gas filled units, the switchgear and bus bars shall be contained in stainless steel/earth screened cast resin enclosure filled with gas at relative pressure between 0.2

and 0.8 bar to ensure adequate insulation and safe operation. The assembly should not require further gas processing during its expected life of operation of 30 years as per Clause GG 2.3 and 3.3 of IS 3427. The degree of protection required against environment shall be not less than IPX4 of IS 12063. The Compact RMU shall have at least an IP54 Protection Index as per IS 12063 against dust and splashing of water. The active parts of the switchgear shall be maintenance free and the Compact RMU shall be of low-maintenance type.

- 4.2 The tank shall be made of suitable stainless steel of adequate thickness or earth screened cast iron resin and shall be able to withstand any accidental internal over pressure of at least 3 bars.
- 4.3 The Compact RMU shall be suitable for mounting on its connecting cable trench. A suitably sized name plate clearly indicating its functional units and their electrical characteristics shall identify each unit. The positions of the different devices shall be clearly visible to the operator on the front of the compact RMU and the operations shall be clearly visible. The compact RMUs shall be such that access to live parts shall not be possible without the use of tools.
- 4.4 The design shall incorporate such features to prevent any accidental opening of the earth switch when it is in closed position. Similarly, accidental closing of Circuit Breaker or Load Break Switch shall be prevented when the same is in open position from the release of any latch or spring in tension due to vibrations caused externally or internally and shall prevent accidents.

5. EARTHING:

- 5.1 There shall be continuity between metallic parts of the Compact RMUs and cables so that there is no dangerous electric field in the surrounding air and safety of the personnel is ensured. The frames should be connected to the main earth bars. The cables should be

earthed by an Earthing Switch having the specified short circuit making capacity. The Earthing Switch shall be operable only when the main switch is open and suitable mechanical fail-proof interlock shall be provided for the same.

- 5.2 The Earthing Switch shall be provided with a reliable earthing terminal for connection to an earthing conductor having a clamping screw, suitable for the specified earth fault conditions. The diameter of the clamping screw shall be at least 12 mm. The connection point shall be marked with the earth symbol. The flexible connections between the earthing blade and the frame shall have a cross section of at least 50 square mm copper or equivalent in aluminum.
- 5.3 The Earthing Switch shall be fitted with its own operating mechanism and manual closing shall be driven by a fast-acting mechanism, independent of operator's action. The moving contacts of the Earth Switch shall be visible in the closed position through transparent covers. Mechanical interlocking system shall be such that the operating staff shall be prevented from closing the Earthing Switch when the main switch is closed.

6. INCOMER LOAD BREAK SWITCHES:

- 6.1 The Load Break Switches shall be maintenance free. The position of power contacts and earthing contacts shall be clearly visible on the front of the Compact RMU. The position indicator shall provide positive contact indication in accordance with IS 9920. In addition, the manufacturer shall prove the reliability of indication in accordance with IS 9921. These switches shall have three positions, viz. Open, Closed and Earthed and shall be constructed in such a way that natural interlocking prevents unauthorized operations. The switches shall be fully assembled in the factory. Manual opening and closing shall be driven by a fast-acting mechanism,

independent of operator's action.

- 6.2 Facility for remote operation in future shall be provided with an electrical operating mechanism in a remote location, without any modification of the operating mechanism and without de-energizing the Compact RMU. The switch and earthing switch mechanism shall have a mechanical endurance of at least 5000 operations.

7. CIRCUIT BREAKERS:

- 7.1 The Circuit Breakers shall be maintenance free. The position of power contacts and earthing contacts shall be clearly visible on the front of the Compact RMU. The position indicator shall provide positive contact indication in accordance with IS 9920. In addition, the manufacturer shall prove the reliability of indication in accordance with IS 9921. These switches shall have three positions, viz. Open, Closed and Earthed and shall be constructed in such a way that natural interlocking prevents unauthorized operations. They shall be fully assembled, tested and inspected in the factory.
- 7.2 An operating mechanism can be used to manually close the Circuit Breaker and charge the mechanism in a single movement. It shall be fitted with a local system for manual tripping. There should be no automatic reclosing. The Circuit Breaker shall be capable of closing fully and latching against the rated making current. Mechanical indication of the "OPEN" and "CLOSED" position of the Circuit Breaker shall be provided. The breakers of the same type and rating shall be interchangeable.
- 7.3 When the Circuit Breaker closing mechanism is of the spring-operated type, it should not be possible for the Circuit Breaker to close until the spring is fully charged and the associated charging mechanism is fully ready for closing. Wherever external spring charging handle is required to charge the spring, it should be ensured that the same is not allowed to move during the release of its

spring energy. Alternately, it should not be possible to release the spring energy till the charging handle is completely disengaged from the mechanism. A visual mechanical indicating device shall be provided to indicate the status of spring viz., "SRING CHARGED" or "SPRING FREE". It shall be possible to charge the spring when the Circuit Breaker is closed and if the spring is released the Circuit Breaker should not open; nor this operation result in any mechanical damage to the component of the Circuit Breaker or its operating mechanism. Alternatively, fast acting reflex mechanism for Circuit Breakers is also acceptable. However, the Circuit Breakers shall be suitable for up gradation to remote operation without any changes.

- 7.4 The Circuit Breaker shall be provided with a suitable protection system that will operate without any auxiliary power supply under fault conditions. The protection system shall comprise of three numbers of Current Transformers of 10P10- accuracy class and have a rated burden of 15 VA and an electronic relay. The Current Transformers shall have a separate metering core of accuracy class 1.0 and burden 3.5 VA for future use. The Current Transformers and Static Relays shall conform to IS 2705 and IS 8686 respectively. The over current protection shall have two separate settings, one low setting with IDMT and the other high setting of definite time type. The earth fault protection shall operate by residual current measurement using the sum of sensory secondary currents. The relay shall be self- powered to operate and trip the Circuit Breaker. The relay shall be provided with a testing port in front of the relay. The range of relay settings from a range of 8 Amperes to 200 Amperes corresponding to the rating of underground cable network shall be available in the protection system.

8. CABLE TERMINATION:

- 8.1 The bushing should be conveniently located for workings with cables specified and allow for the termination of these cables in accordance with the prevailing practice and guidelines of cable manufacturers. The dimensions of the terminals shall be in accordance with IS 10601. A non-Ferro-magnetic cable clamp arrangement shall be provided for each cable to be terminated in the Compact RMU. Suitable locking arrangement of the Circuit Breakers, Earthing Switches and Load Break Switches with padlocks in the "Open" or "Closed" position shall be provided.
- 8.2 A "Cable Alive" indicator lamp in the front of Compact RMU shall be provide for each cable using a capacitance voltage divider.
- 8.3 It must be possible to test the core or sheath insulation of the cables without de- energizing the remaining section of the Compact RMU without accessing the cable compartment and without disconnecting the cable.

9 SAFETY OF EQUIPMENT:

- 9.1 In case of SF6 filled equipment, any accidental overpressure inside the sealed chamber shall be limited by the opening of a pressure-limiting device in the rear part of the enclosure so that the gas will be released away from the operator.
- 9.2 All manual operations shall be carried out on the front of the Compact RMU. The effort required to be exerted on the lever by the operator shall not exceed 250 N.

10 FRONT PLATE:

- 10.1 The front plate shall be provided with IP2X degree of protection conforming to IS 12063. The front plate should include a clear mimic diagram indicating the functions. The position indicators shall correctly depict the position of the main contacts and shall be clearly visible to the operator. The lever operating direction shall

be clearly indicated.

11 TESTS:

- 11.1 Type test reports for all the type tests required to be conducted as per the standards mentioned in these specifications shall be furnished prior to supply.
- 11.2 Routine tests and acceptance tests shall be conducted in accordance with these standards in presence of the purchaser's representatives. The contractor shall give at least 15 days advance notice for witnessing these tests. Copies of test reports of all these tests shall be furnished to the purchaser for approval. Each completely wired Compact RMU shall be tested to ensure all of its protective; control and interlock systems operate satisfactorily. The tenderer shall indicate the tests to be carried out in the field after the installation and before commissioning.

12 INSTRUCTION MANUALS:

- 12.1 Three copies of installation, operation and maintenance manuals shall be supplied along with the equipment. Two additional copies of these manuals shall be supplied at the time of commencement of works before the materials are supplied. These manuals shall be complete in all respects furnishing the constructional and operational features of the equipment. The same shall contain all the details and required drawings and/or illustrations along with the overall procedures to enable to identify all the parts and consumable spares, which may have to be identified readily for ordering purpose.

13 FORMATION OF COMPACT RMU:

- 13.1 The compact RMU shall be of single bus bar, outdoor type, tropicalized in accordance with the relevant clauses mentioned in these specifications. An earth fault passage indicator using a core

balance Current Transformer shall be provided for the Incomers to assist in identifying the faulty cable section in order to isolate the same.

13.2 The Incomer panel shall comprise of, but not limited to the following:

1. A triple pole Vacuum / SF6 Load Break Switch rated 630 Amps or higher, with a rated making capacity under fault conditions with short circuit levels of 25 KA or above at 11 KV
2. Core balance Current Transformer and earth fault passage indicators (The indicator flag of the relay shall be visible till such time the relay is reset manually) These shall not require any external Power Supply and must be suitable for unattended places.

13.3 The transformer loop circuit control panels shall consist of but not limited to the following:

1. A triple pole Vacuum/SF6 Circuit Breaker rated 200 Amps or higher, with a rated making capacity under fault conditions with short circuit levels of 25 KA or above at 11 KV
2. Manually charged spring closing mechanism
3. Electronic relay with associated 15 VA burden Current Transformers of accuracy class 10P10 and tripping mechanism
4. Mechanical "ON", "OFF" indicator
5. Manual tripping device
6. Mechanical "Spring Charged", "Spring Free" indicator in case of stored energy devices.
7. Provision for retrofitting meters and SCADA System.

14 ACCESSORIES:

14.1 The following accessories shall be provided for each compact RMU:

1. Pad locks for all doors with one set (3 Nos.) Master keys
2. Earth bus formed out of 50X6 mm GI earthing flats.
3. Wire guard protective mesh on the front doors and back for prevention of pasting of papers etc.
4. Base channel with foundation bolts
5. Ventilating louvers with weld mesh
6. Live part shrouds, danger plates, caution boards, name plates,

rating plates etc. as per requirements

7. Bus bar supports (Porcelain insulator support) as required.
8. All other components, even though not specifically mentioned, but required for the safe operation of the unit.

15 INFORMATION TO BE FURNISHED PRIOR TO SUPPLY:

The following information shall be furnished:

1. Completely filled in the "Guaranteed Technical Particulars" given below.
2. Catalogues describing the equipment duly indicate the model.
3. Literature describing the operational features.
4. Typical GA drawings
5. Type Test Certificates
6. Foundation drawings.

16 GUARANTEED TECHNICAL PARTICULARS FOR 11 KV CIRCUIT BREAKERS AND LOAD BREAK SWITCHES

A) SF6 / Vacuum Circuit Breaker:

a)	Type	
b)	Rated Voltage	
c)	Breaking Current	
d)	Making Current	
e)	Rupturing Capacity	
f)	Rated Current	
g)	No. of Poles	
h)	Operating mechanism	

B) Load Break Switches:

a)	Type	
b)	Duty cycle	
c)	Rated current	
d)	Rated breaking capacity	
e)	Fault making capacity	

Section:8B Technical Specifications

f)	Rupturing Capacity	
g)	No. of poles	
h)	Operating mechanism	
i)	SF6 tank	
j)	Interlocks	
k)	Operation safety	

C) BUS BAR:

a)	Material	
b)	Type	
c)	Rated Current	
d)	Short time rating for 3 / 1 Sec.	

D) Protection:

a)	<u>Protection:</u>	
----	--------------------	--

GUARANTEED TECHNICAL PARTICULARS FOR RMU

The Tenderer shall furnish the following data for the Load Break Switches and Circuit

Breakers used in the Compact RMU:

1. Rated Voltage
2. Rated Insulation Level
3. Rated Frequency
4. Rated Normal Current
5. Rated cable charging breaking current.
6. Rated short circuit breaking current.
7. Rated transient recovery voltage for terminal faults.
8. Rated characteristics for short line faults.
9. Rated short circuit making current.
10. Rated duration of short circuit
11. Rated opening time, break time and closing time.
12. Type test certificates
13. Constructional features
14. Details of operating mechanism
15. Overall dimensions of Compact RMU
16. Limits of gas pressure (in case of SF6 filled equipment)
17. Clearances between live parts and contacts

Section:8B Technical Specifications

18. Total transportation weight
19. Special features if any
20. Foundation loads and details
21. Internal Arc Test for Outdoor applications.

K-RIDE