

## **TECHNICAL SPECIFICATION**

The Supply, Installation, testing & commissioning of all items and materials shall be made in accordance with the particular specifications, latest revision of codes & standards or equivalent.

### **1.0 ALIGNMENTS**

- 1.1** The plans showing the tentative alignment of the cables and lines is enclosed for the guidance of the tenderer. The Engineer-In-charge shall have the right to change alignment in case of any difficulty or obstruction and no claim shall be entertained on account of any such change.
- 1.2** No claim shall be entertained for difficulties in access to the site of works, crossing of drains, ponds, railway tracks, culverts, telephone ducts, electric cables, rocky area, seepage of water from any sources etc. along the alignment.
- 1.3** The alignment may be provided in part or full and the contractor shall have to start the work at the available reach. The contractor shall not be eligible for any compensation on account of the delay caused due to non-availability of the site to be arranged by the employer except extension to date of completion.

### **2.0 KERALA CLIMATIC CONDITIONS OF THE INSTALLATION**

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|--|---|
| a) Maximum Ambient air temperature               | : 38deg. C  |
| b) Minimum ambient air temperature               | : 17 deg C  |
| c) Maximum daily average ambient temperature     | : 30deg.C   |
| d) Maximum humidity                              | : 86%   |
| e) Minimum humidity                              | : 59%   |
| f) Average number of thunderstorm days per annum | : 100   |
| g) Average number of rainy days per annum        | : 188   |
| h) Average annual rainfall                       | : 3230mm  |
| i) Rainy Months                                  | : June to mid September &<br>October to mid December. |
| j) Altitude above M.S.L. not exceeding           | : 2 to 6 Meters                                       |

The atmosphere is generally laden with mild dust in suspension during the dry months and is subjected to moisture laden winds in rainy and cold months. Since the region lies in the south western coast, the climate is tropical, with only minor differences in temperatures between day and night, as well as over the year. The climate is cloudy during monsoon. The design of equipment

and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.

**3.0 SPECIFICATIONS:** All line materials, conductors, insulators, clamps, tower parts etc must be ISI certified and supply must be from approved suppliers of the DMRC/KSEB. All material shall be as per relevant IS/ DMRC/ KSEB Specifications. The materials and equipments including Towers, line materials and accessories, etc are to be got approved in advance by the DMRC/KSEB authorities by submitting specifications, drawings and test certificates as per IS standards.

### 3.1 SCOPE

1.1 Scope includes supply/manufacture, testing before dispatch and delivery FOR destination, of ACSR DOG Conductors of sizes as per BOQ conforming to IS and relevant IEC standards.

### 3.2 STANDARDS:

3.2.1 Unless otherwise stated hereafter, rating, characteristics, test and procedures etc. concerning conductors shall be preferably as per IS, IEC standards given below and shall be in compliance with the latest edition or revisions thereof and meeting the constructional details and testing requirement as stipulated in KSEB specifications, vide clause 4.2 and 4.3 below, in foregoing also.

3.2.2 The materials including ACSR Conductors may conform to any other authorities' standards, which ensures an equal or better quality than the standard mentioned above. The bidder must specifically indicate the standards to which the cable conforms and indicate all deviations (if any) from the preferred IS/ IEC codes that affect performance and rating and prior approval shall be obtained from DMRC/KSEB for the use of the same.

3.2.3 Compliance of the ACSR Conductors manufactured with the provisions of this specification does not relieve him of the responsibility of furnishing materials and accessories of proper design, electrically and mechanically suited to meet the operating guarantees at the specified service conditions.

3.2.4 If there are, in the opinion of the bidder, any conflicts between these codes and this specification, these contradictions shall be brought to the attention of the utility owner and approval shall be obtained there for

3.2.5. Any alternate proposals for the tower design if possible, requiring a lesser extent of land varying from the design proposed the same shall be got approved from DMRC/KSEB in advance and the same shall be adopted depending on site conditions.

## 4. TESTING

### 4.1 GENERAL:-

4.1.1 The site tests shall be carried out during and after laying/installation by the bidder as per relevant standard.

4.1.2 This test schedule can be modified at the discretion of the purchaser to omit or to include additional tests.

### 5.0 Statutory Clearances: -

The contractor shall coordinate on behalf of owner, for obtaining necessary clearances for laying of cable and carrying out excavation/ digging work from the authorities on behalf of the Employer and provide requisite copies of information maps, survey report etc. to the authorities. The employer shall assist the contractor in obtaining such clearances by providing the authority letter or any other relevant document. The contractor shall ensure quick and speedy clearances in order to implement the project within stipulated schedule. In case the authorities have some objections on certain sections of routes proposed and are unwilling to provide clearances, the contractor shall propose an alternate route, promptly carrying out the survey and submit specific survey report for that and reapply for clearance after taking into account the comments/objections of the authority. The clearance of the Chief Electrical inspector under Electricity laws shall solely be in contractor's scope.

### 6.0 EXCAVATION

The work involves earth excavation for tower footing, back filling and removal of excess earth from site. The excess earth shall be disposed- off at approved locations of local Authorities. The rates shall include all leads & lifts involved in disposal of excess earth. The work site shall be left as clean as possible.

The excavation shall be done using manual /mechanical modes as per field conditions and only after having clearances from local Authorities regarding any buried services like Telecommunication /Gas pipe line etc. Field office shall assist in getting such clearances. Most main roads are of asphalt surface and some of the roads with cement concrete surface.

Suitable barriers should be erected between the work spot and pedestrian/ motorway to prevent accidents. Warning and caution boards /Tape should be conspicuously displayed.

The excavated material shall be properly stored to avoid obstruction to public and traffic movement.

## 7.0 DAMAGE TO PROPERTY

The contractor shall take all precautions while excavation of footing, trial pits etc., to protect the public and private properties and to avoid accidental damage. Any damage so caused shall be immediately repaired and brought to the notice of the Employer.

The contractor shall bear all responsibilities and liabilities and shall bear all costs of the damages so caused by him or by his workman or agents.

## 8.0 BACK FILLING:

Normally back filling shall consist of the material earlier excavated. However, bigger stones or pieces of rock should be removed & shifted to approved locations of local authority. The compaction of Earth filling shall be ensured by the contractor as per specification

## 9.0 IDENTIFICATION

The identification of each phase shall be clearly and properly noted. The cable shall be jointed as per the approved design. Each conductor shall have identification for phase at tower locations.

## 10.0 MAKING A JOINT

Comprehensive jointing instructions should be obtained from the manufacturer of jointing materials and from KSEB and meticulously followed.

The materials used in the joints shall be of good quality and conform to standards. The jointing tools shall be appropriate and as per the requirement of jointing of conductors.

## 11.0 Earthing:-

Bidder shall carry out the earthing of towers using GI pipes. Earthing shall be as per relevant standards.

## 12. INSTRUCTIONS FOR STORAGE, TRANSPORTATION, HANDLING, LAYING AND INSTALLATION OF ALL MATERIALS

The instructions / the broad guidelines provided for storage, transportation, handling, laying, jointing, termination, testing and commissioning of the materials shall be strictly followed.

### 12.1 Storage:

12.1.1 The site chosen for conductor drums should be well drained, firm and should always have firm surface, preferably concrete surface which will not cause the drums to sink and thus lead to flange rot and extreme difficulty in moving the drums. The area should

have proper drainage arrangement, to avoid water stagnation.

- 12.1.2 All drums should be neatly placed in rows, properly aligned for easy movement and stored in such a manner as to leave sufficient space between the drums for air circulation and also to facilitate taking out any drum from the row. It is desirable to retain the battens to enable the drum stand directly over the battens
- 12.1.3 Overhead covering is not essential unless the storage is for a very long period. When for any reason, it is necessary to rewind a conductor on another drum; the barrel of the drum in no case should have a diameter less than that of the original drum.
- 12.1.4 The cable drums will be stacked at suitable place near the site and the contractor will have to transport the same for laying at site.
- 12.1.5 Any shortage, theft, damage will be made good by the contractor at his own cost.

## 12.2 **Transportation:**

- 12.2.1 The drums or coils or other materials must not be dropped or thrown from Railway Wagons or trucks during unloading operations. The contractor shall be responsible for any damage to the conductors and other materials during transit due to improper and inadequate packing. Wherever necessary, proper arrangement for lifting, such as lifting hooks, shall be provided. Any cable or other materials found short inside the packing cases shall be supplied by the supplier/Contractors, without any extra cost.
- 12.2.2 Transportation for short distance can be done on drum carriers. Otherwise it may be transported in trucks/trailers.

## 12.3 **Handling:**

- 12.3.1 Movement of Conductor Drums:-The arrows painted on the flanges of the drum indicate the direction in which the drum should be rolled. The cable will unwind and become loose if the drum is rolled in the opposite, direction.
- 12.3.2 Removing Conductor from Drums:-The cable should only be removed from the drum by first mounting the drum on to the drum carrier. Alternatively, the drum be raised above ground level using suitable jacks to support a spindle put through the drum at each end. A spindle of sufficient strength to avoid any bending of the spindle and facilitate carrying the full weight of the drum must be used. The drum carrier necessarily must have proper bearings. Ball bearings are preferred over sleeve bearings.

## 12.4 **LAYING:**

- 12.4.1 Route: The Engineer installing the line must study the drawing and the route already selected and approved by competent authority. The route be surveyed keeping in view the immediate and ultimate use of line as an integral part of transmission and distribution system.

**13. MISCELLANEOUS ITEMS: ELECTRIC CONNECTION/DIVERSION OF ROAD OBSTRUCTION ETC.**

13.1 The contractor shall be fully responsible for barricading of the work site, putting of sign boards with florescent paint lettering for day and red lamp for the night, employing chowkidar and taking any other precautions as per traffic rules, pay penalty for violating the rules if imposed by any department/authority, the police authority for safety of the public work, the contractor shall have to born this at his cost.

13.2 The contractor shall also make necessary arrangement of his own diesel generator sets required for the work so that the same can be used by him during failure of non availability of electricity. Necessary permission etc., if required shall be taken by him from the concerned authorities.

13.3 All water mains, sewer, cables water/sewers connection in individual or any other obstruction coming in the alignment shall be supported free of cost by the contractor. No payment for temporary support will be paid. In case of damage to any utility DMRC shall be indemnified against such damage at no extra cost.

13.4 The road/footpath maintenance and inter utility code of conduct as attached shall be part of the contract and shall be strictly followed by the contractor. The code of conduct contains the detailed instructions to regulate the road excavating trenches activities for ensuring minimum inconvenience to the road/footpath users.

13.5 The contractor shall obtain necessary permission from KSEB/DMRC for execution of the same including shut down required for the job as per earliest of issue of acceptance letter. The DMRC shall extend all necessary help in the matter but responsibility of obtaining permission shall rest with the contractor only. Delay, if any, is to be absorbed within the completion period. Delay in obtaining the permission, more than the reasonable time, as determined by engineer-in-charge, will be considered as sufficient grounds for annulment of the award of contract and forfeiture of the tender security.

**14.0 APPROVED MAKES AND SOURCES OF MATERIALS.**

14.1 Sources of materials being supplied shall be intimated to the Engineer shall be of the reputed make only and are subject to his approval, Materials that are not specified in the contract document shall conform to the relevant Indian Standards, KSEB or in their absence

conform to any National / International Standard, approved by the Engineer. All material shall be IS Certified/ ISI marked.

14.2 Contractor shall use the material of approved make as indicated below unless specified otherwise in BOQ or as approved by the Employer's representative.

14.3 The Contractor shall ensure the correct selection of the approved make meeting the specifications and application duties. Before placing order for procurement, the make shall be got verified for its suitability to the specification, KSEB requirement and application duty. However Employer's representative/ engineer reserve the right to opt for best preferred listed make.

14.4 The Contractor shall quote the rates for material and equipments as per the list of approved makes :

S. No.	ITEM	MAKES
1	G.I .Pipe	Jindal, TATA
2	Hard ware fittings	RUL/ITPL/TYCO/BURMA Electro Corporation or as approved by KSEB

In addition to the makes/suppliers mentioned in clause 14.4 other equivalent make acceptable to KSEB can be used. However in case of other makes it should be IS certified and the contractor has to get the make approved KSEB at no extra cost to DMRC and the approval has to be absorbed within the completion period only and no extra period will be permitted for the same.

## 15.0 TESTS

All routine, acceptance shall be carried out in accordance with the relevant IS/IEC. Acceptance tests shall be witnessed by the DMRC/ authorized representative of DMRC. Internal Test report and packing list of materials shall be submitted along with the Inspection request.

All the components should also be type tested as per the relevant standards. Copies of the type test certificates from any Government/ Recognized testing labs shall be submitted and the type test certificates should not be older than 5 years.

The contractor shall supply free of charge all manufacturer's test certificates or other test certificates showing that the materials have been tested in accordance with /relevant Codes of IS/ KSEB Specification.

## 16.0 Rejection

Any materials that have been found not to conform to the specifications shall be rejected forthwith and shall be removed from the site by the contractor at his own cost.

## 17.0 Testing and Commissioning

Before commissioning all relevant tests as required by KSEB are to be carried out & the test results recorded should be furnished for record.

## **18.0 PILE Foundation Geometry for Towers.**

### **18.1 PILE Foundation Geometry : Y type Tower**

Size of the Chimney = 500 mmX500 mm.

Dia of the Pile,  $D_p$  = 1000 mm.

$h''$  = 620 mm.(portion above Chimney)

$h'$  = 600 mm. (height of chimney))

$f$  = 700 mm. m(potion of pile cap above GL)

Pile Center to center Distance = 3000 mm.

Height of chimney,  $h$  = 600 mm.

Length/Width of the Cap,  $L/B$  = 4300x1300 mm.

Cap Thickness,  $t$  = 1200 mm.

PCC= 100mm thick (1:4:8)

No. of Pile Per Leg = 2 Nos

Concrete Mix (a) RCC -M25 with 20msa for Piles and Pile caps

(b) PCC - 1:4:8 with 40 msa

Reinforcement steel grade Fe 415

All piles are bored CAST IN SITU, Piles to installed using DMC method

Specification of Bentonite slurry shall be as per CL.A-3 of I.S. 2911 (Part -1/Sec.2) 1979

Pile Load test can be conducted to determine the allowable capacity of pile.

piling shall be carried out in strict accordance with I.S.2911(Part 1/ Sec 2) -1979.

This is the common design used in KSEB for Y type Tower.

Conduct SPT at each location and furnish the report before the Deputy Chief Engineer, Transmission Circle, Kalamassery for further modification in foundation design based on Soil Investigation Report.

Concrete unit samples for pile and pile cap are to be taken and Testing at Govt approved Institutions.

28 days cube strength of concrete for Pile;  $f_c' = 30$  Mpa.

28 days cube strength of concrete for Pile-Cap;  $f_c' = 25$  Mpa.



Corresponding cylinder strength of concrete for Pile-Cap;  $f_c' = 21.25 \text{ Mpa}$ .

Yield Strength Reinforcing Steel ;  $f_y = 415 \text{ Mpa}$ .

Concrete Clear Cover at top and sides of Cap & Column is = 50 mm.

Concrete Clear Cover for sides of Pile is = 75 mm.

Unit Weight of Concrete = 24 kN/Cum.

### **18.2 PILE Foundation Geometry : Z type Tower**

Size of the Chimney = 500 mmX500 mm.

Dia of the Pile,  $D_p = 1000 \text{ mm}$ .

$h'' = 620 \text{ mm}$ . (portion above Chimney)

$h' = 600 \text{ mm}$ . (height of chimney))

Pile Center to center Distance = 3800 mm.

Height of chimney,  $h = 600 \text{ mm}$ .

Length/Width of the Cap,  $L/B = 5100 \times 1600 \text{ mm}$ .

Cap Thickness,  $t = 1500 \text{ mm}$ .

PCC= 100mm thick (1:4:8)

No. of Pile Per Leg = 2 Nos

### **18.3 PILE Foundation Geometry : D60 & X type Tower**

Size of the Chimney = 500 mmX500 mm.

Dia of the Pile,  $D_p = 600 \text{ mm}$ .

$h'' = 620 \text{ mm}$ . (portion above Chimney)

$h' = 600 \text{ mm}$ . (height of chimney))

Pile Center to center Distance = 2000 mm.

Height of chimney,  $h = 600 \text{ mm}$ .

Length/Width of the Cap,  $L/B = 2900 \times 1000 \text{ mm}$ .

Cap Thickness,  $t = 1000 \text{ mm}$ .

PCC= 150mm thick (1:4:8)

No. of Pile Per Leg = 2 Nos