

SECTION – II

TECHNICAL SPECIFICATIONS

FOR

SURVEYS AND TOWER SPOTTING

SECTION-II

DETAILED TECHNICAL SPECIFICATIONS FOR CONDUCTING SURVEYS AND TOWER SPOTTING

GENERAL

APPLICABLE STANDARDS

ROUTING

SURVEYS

PROFILE

TOWER SPOTTING

SECTION – II

DETAILED TECHNICAL SPECIFICATION FOR CONDUCTING SURVEYS AND TOWER SPOTTING

1.00 General:

The survey shall be executed very carefully and accurately. Hence sufficient care shall be taken to avoid both field and office errors by adopting sufficient checks and cross checks. This is very necessary since it may involve unnecessary heavy expenditure by way of realignment with additional towers, increase in length of conductor etc.

2.00 Applicable Standards:

IS 5613 Part – II(B) Section – II: Code of practice for design, installation and maintenance of overhead power lines.

3.0 Routing:

KPTCL has got done the detailed surveys of the lines. The tower profiles and tower spotting data will be furnished to the successful bidder along with the to-po extract of the area through which the lines have to pass through. This is to enable the contractor to carry out a walk over survey / route inspection / check survey of the detailed surveys got done by KPTCL. In case the contractor finds upon verification that the detailed surveys got done by KPTCL is not feasible for execution, then the contractor shall conduct detailed survey afresh for the stretches where the alignment is not feasible and the size shall be approved by the Engineer. The detailed surveys to be so got done by the contractor shall follow the guidelines as enumerated here below in the succeeding paragraphs.

The scope of check survey also includes preparation of route alignment map as per check survey, tower profiles and tower schedules and obtaining approval of the concerned engineer.

The route shall be aligned preferably close to an all-weather road. This is to ensure accessibility to the line both during construction and later during line patrolling and maintenance. The routing shall also confirm to the following clauses from 3.1 to 3.11.

3.1 LOCATING THE 220-110/66KV MCMV TOWERS: (If applicable only)

As far as possible the new towers shall be located in the same place where the existing towers are situated. If required intermediate tower can be located if the span exceeds the design span.

3.2 Railway Crossings:

The latest regulations governing crossings of overhead lines above railway tracks shall be strictly followed in so far as maintaining the vertical clearance above the tracks and in the location of the towers adjacent to the railway tracks and railway station limits. Wherever railway crossings are involved a detailed plan and profile showing all details of railway tracks shall be prepared and submitted to KPTCL along with questionnaire of railway authorities duly filled in. The towers on either side of the railway track shall be anchor towers with double tension insulator strings.

3.3 River and Nallah Crossings:

River crossing towers shall be located in the straight reaches of the river, since the flow in these reaches is uniform without much stress on the flood banks. The clearances as stipulated in the latest I.E. Rules for

both navigable and non-navigable rivers shall be strictly followed. The same is also indicated in transmission manual, Chapter-4 of CBIP.

3.4 **Telecommunications:**

Parallelism:

The transmission lines shall be routed to be as far as possible away from existing P & T and other Telecommunication lines such that a safe distance of at least 3 (three) KMs is maintained in the run of parallelism between power and telecom lines. KPTCL will obtain necessary statutory clearances from PTCC authorities if required.

Crossings:

The angle of crossing above the telecom lines shall as far as possible be 90° and in no case less than 60°. No guarding is required to be interposed between power and telecom lines.

A minimum vertical clearance of 3.05mt shall be maintained between the lowest power conductor and the telecommunication circuit in respect of 220 kV, respectively (as per CBIP, Chapter-4).

3.5 **Plantations:**

It is necessary to avoid coconut, areca nut, rubber and other cash crop plantations. If it is not possible to avoid such plantations, then the line shall cut across the corner or the thinnest belt of such plantations.

3.6 **Marshes and Back Waters:**

Marshes and backwaters shall under all circumstances be avoided.

3.7 **Wet Land:**

It is desirable to avoid long stretches of wetlands but where such crossings are inevitable, then the towers shall be located in dry land.

3.8 Road Crossing:

It is desirable to cross National and State Highways at 90° and in any case not less than 60°. Towers to be located at the crossing span should be located such that one tower is close to the Road nearer by about 30 M to 40 M. Besides the crossing span shall be limited to 75% of the ruling span.

The vertical clearance shall be as stipulated in I.E/CEA Regulations but further enhanced by another 0.3 M so as to ensure better safety and clearances between tractors, trailers, trucks and lorries loaded with huge packages. Thus a minimum clearance of 10.0M shall be maintained between the lowest conductor and the top surface of the Road. The towers on either side of National and State Highways shall be with double suspension / tension strings and shall be tension type towers. The maximum span shall be 250 m.

3.9 Aerodromes:

3.8.1 Civil Installations:

The regulations of the civil aviation authorities shall be strictly followed while routing the lines. Accordingly the line shall be routed to be about 12.8 KM away from the final approaches of the runways or 8 KM from the perimeter of the aerodrome. KPTCL will under no circumstances approach the civil aviation authorities for waiver of these clearances if there is any infringement of these stipulated clearances.

3.8.2 Defence (I.A.F. Installations):

The routing of the line in the vicinity of defence (I.A.F. installations) shall follow the following stipulations.

Within 805 M of Radar and Wireless Receiving Stations.	No structure of any height
Between 805 M and 3200 M	Structure of not more than 24.4 M height
Between 1375 Mtrs and 3200 Mtrs from the perimeter of the air field	An angle of less than 1° 9 min from Aerodrome outer perimeter to the top of the structure.
Within flying funnel area of an air field up to 1373 M from the nearest end of the runway.	- Do -

3.10 Power Line Crossings:

A minimum clearance as per table below shall be maintained between the lowest power conductor and the top most conductor of the other power line.

Minimum clearances between lines

Crossing each other (Meters)	11KV-66 kV	110-132kV	220 kV	400KV	765KV
Below 11 kV	2.44	3.05	4.58	5.49	7.94
11KV -66 kV	2.44	3.05	4.58	5.49	7.94
110-132KV	3.05	3.05	4.58	5.49	7.94
220 kV	4.58	4.58	4.58	5.49	7.94
400kV	5.49	5.49	5.49	5.49	7.94
765kV	7.94	7.94	7.94	7.94	7.94

3.11 Clearance from Buildings:

The line shall preferably be routed away from buildings, huts by at least 15 M. But where this is inevitable the vertical & horizontal clearances shall be maintained as per the latest CEA Regulations – Measures relating to safety and Electric Supply Regulations.

a) Vertical Clearances:

For lines exceeding 33KV - $3.7M + 0.3M$ for every additional 33KV or part thereof.

b) Horizontal Clearances:

For lines exceeding 33KV - $2.0M + 0.3M$ for every additional 33KV or part thereof.

3.11 Miscellaneous:

The line shall be routed so as to be sufficiently away by at least 15 M, from temples, churches, mosques, other religious institutions, burial and cremation grounds, cemeteries, archaeological monuments and other historical landmarks.

4.0 Surveys:

4.1 Reconnaissance:

The route should be reconnoitred by duly taking into consideration various local factors such as physical features, roads, rivers, etc., and to provisionally fix a feasible route on the map.

4.2 Preliminary Survey:

The bidder shall compulsorily conduct the preliminary survey/inspection of the proposed route to have a feeling of the actual problems that would be encountered during erection, stringing etc. The quantities and types of tower, type of foundations etc., and other line materials shall be based on the above survey.

The function of the preliminary survey is to ensure that the reconnoitred route is feasible for execution on the ground. It is preferable that the preliminary survey be completed using a theodolite.

4.3 Detailed Survey:

The Detailed survey shall be carried out in accordance with IS 5613 (part-2, Section 2)-1985.

5.0 **Profile:**

After completion of detailed survey namely final theodolite alignment, chain survey levelling along the alignment and tachometric survey in hill ranges, the results shall be plotted in continuous centimetre graph sheet rolls. These rolls shall preferably be 10 M in length and 60 cm in width. The profile shall be plotted to a scale of 1 cm: 2 m vertical and 1 cm : 20 m horizontal.

The bottom 10 cm shall be utilized for plan and balance for longitudinal section.

The following details shall be incorporated in the profile.

5.1 **L.T. Line and 11 kV Line and Other EHT Lines:**

Voltage, number of phases, number of circuits, type of construction, vertical, triangular or flat, distance of adjoining poles, angle of crossing, numbers of poles, if any. Height to top most wires from the ground have to be shown in the levelling sheets to check adequacy of clearance.

5.2 **Telephone Lines:**

Number of wires whether service, phone, carrier, distance of adjoining pole and angle – numbers on pole if any. The angle of crossing should not be less than 60° otherwise the telephone line has to be deviated. Height of top most wires from the ground has to be shown in the levelling sheets to check adequacy of clearance.

5.3 **Telegraph Lines:**

Number of wires whether service, phone, carrier, distance of adjoining pole and angle – numbers on pole if any. The angle of crossing should not be less than 60° otherwise the telephone line has to be deviated. Height of top most wires from the ground has to be shown in the levelling sheets to check adequacy of clearance.

5.4 **Roads:**

Whether national highways, state highways, inter district road, minor metalled road, graveled road, cart track, etc. Type of surface road width, road limit, LT and telephone lines on road margin.

5.5 **Rivers, Water Courses:**

M.F.L. – Flood banks – navigable or not – if navigable height of topmost mast – condition of flood bank – liable to scour or not, protective work, if any – bridges nearby.

5.6 **Irrigation Channels, Drains:**

MWL position of bank and height. The bottom of the foundation of the tower has to be above hydraulic gradient.

5.7 **Buildings, Huts, Etc.**

Accurately up to 15 Mtrs and approximately beyond 15 Mtrs up to 30 Mtrs – the type and height of roofing. It is desirable to avoid taking the EHT lines over the buildings. But where this is inevitable the vertical & horizontal clearances shall be maintained as per the latest CEA Regulations – Measures relating to safety and Electric Supply Regulations.

c) Vertical Clearances:

For lines exceeding 33KV - 3.7M + 0.3M for every additional 33KV
or part thereof.

d) Horizontal Clearances:

For lines exceeding 33KV - 2.0M + 0.3M for every additional 33KV
or part thereof.

	Vertical in Mtrs.	Horizontal in Mtrs
66 kV	4.0	2.3
110 -132KV	4.6	2.9
220 kV	5.5	3.8

- 5.8 Temples, Churches, Mosques and other religious institution to be avoided within 15 Mtrs.
- 5.9 Burial and cremation grounds to be avoided within 15 Mtrs.
- 5.10 Swamps, outcrop of rocks – precipices – these are to be shown to avoid location of tower.
- 5.11 Vertical drops and tenaces – to assess clearances and location of tower.
- 5.12 Cross slops – at suitable intervals for assessing clearance of location of tower to be taken 15 mtrs on either side of the longitudinal section to be plotted at a separation distance of 5 mtrs above and below for 66 kV and 110-132 kV lines and 8 mtrs above and below for 220 kV lines for assessing clearance.
- 5.13 Type of cultivation – Wet, Dry, etc.
- 5.14 Type of plantation – Rubber, Tea, Coffee, Cardmum, Coconut, Arecanut etc.

5.15 **Railway Track:**

- a) Angle of crossing must be at least 60°.
- b) Between railway station with their names.
- c) Whether inside or outside station limits.
- d) Whether track has to be electrified/electrified or not.
- e) Gauge – Broad Gauge, Narrow Gauge, Meter Gauge.
- f) Number of tracks – single, double, etc.
- g) Level of top of rail.
- h) Clearances expected for the line over the tracks for the line.

6.0 **Tower Spotting:**

6.1 **Sag Template:**

KPTCL will furnish the necessary sag – template and tower spotting charts to the successful bidder on a blue print. The Contractor shall prepare the same on an acrylic/plastic sheet and submit one copy to the Engineer for verification of profiles.

6.2 **Tower Location:**

The tower location shall be marked on the profile using the owner supplied sag – template and tower spotting chart. The following points shall be taken into consideration while spotting the tower locations.

6.3 **Span:**

The number of consecutive spans between the section points shall not exceed 15 spans or 5 KM in plain country and 10 spans or 3 KM in hilly

terrain Section-A point shall be taken to comprise of a tension point with 'B' type or 'C' type tower.

6.4 Extensions:

An individual span shall be as near to the normal design span as possible. In case an individual span becomes too short with normal supports on account of undulations in ground profile, one or both the supports of the span may be extended by inserting standard superstructure extensions (3 M or 6 M extensions) designed for the said purposes, so that the span is nearer the normal span and within the designed wind/weight span as per the decision of the owners representative.

There shall not be any upward force on suspension towers under normal working conditions and the suspension towers shall support at least the minimum weight span as provided in the designs. In case uplift is unavoidable, it shall be examined if the same can be overcome by adding standard superstructure extensions to the towers failing which tension towers shall be employed at such positions.

6.5 Tower Schedule:

The profile sheets duly spotted, along with tower schedules indicating type of towers, type of foundations, wind span, angle of deviation, river or road crossing and incorporating other details as in Clause 5.0 shall be got approved from the owner before execution.

6.6 Check Survey Of Tower Location:

A check survey shall be conducted to make a check on detailed survey and to relocate, if found necessary, the tower positions on ground conforming to the approved profile and tower schedule. In the process, it is necessary to have the pit centres peg marked. The contractor shall

prepare the route alignment maps, tower schedules and tower profiles and submit the same to the owner for approval.

The scope covers Conducting detailed check survey along the approved route duly following the route alignment, GPS co-ordinates, submission of detailed line schedule, tower schedule and comparing the same with respect to detailed survey report, bringing out the differences if any. Submission of contour maps for undulated/hilly tower. the work also includes marking corridor width in the field and computing the quantum of benching and revetment, preparation of detailed land schedule along the corridor on the digitized revenue village maps indicating Sy. No. falling within the corridor for the purpose of estimation of the land compensation, submission of detailed consolidated hard copy of reports of check survey in 6 sets along with soft copy for approval in all types of terrain per Km.
