	Project	108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE	Document Title	TECHNICAL SPECIFICATION OF TRANSMISSION LINE SURVEY WORKS			
Document Number	SP-E0018-CEE-ETL-TS-0002		Revision	R0	Sheets	19	

PROJECT: 108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE

EMPLOYER:  **CECA SL GENERATION LIMITED ("CECA SL")**

EMPLOYER'S ENGINEER (EE):  **SARGENT & LUNDY L.L.C**

CONTRACTOR:  **SHAPOORJI PALLONJI & CO. PVT. LTD. (EPC DIVISON)**

CONTRACTOR'S ENGINEER (CE):  **FICHTNER CONSULTING ENGINEERS (INDIA) PVT. LTD, BENGALURU**

DOCUMENT TITLE: TECHNICAL SPECIFICATION OF TRANSMISSION LINE SURVEY WORKS

SP DOCUMENT NUMBER: SP-E0018-CEE-ETL-TS-0002

REVISION STATUS

	SIGN													
	INITIALS													
R0/P 0	SIGN													
	INITIALS	AT	JS	MLC	DM	SK	BP	BM				ISSUE FOR PURCHASE	19.02.2025	
REV		DSN	CHD	APD	CV	EL	IC	ME	QA	APPROVED	DETAILS OF REVISION	DATE		
		FI			SPEPC									

**EPC****Project****108.4 MW (GROSS) CCPP AND
UPGRADE WORKS OF 33KV
NETWORK, AT REPUBLIC OF
SIERRA LEONE****Document
Title****TECHNICAL SPECIFICATION FOR
TRANSMISSION LINE SURVEY
WORKS****Document Number****SP-E0018-CEE-ETL-TS-0002****Revision****R0****Sheets****2 OF 19****INDEX****SECTION****TITLE****TECHNICAL SPECIFICATION****1.0****GENERAL TECHNICAL SPECIFICATION****2.0****DETAILED TECHNICAL SPECIFICATION****2.1****33KV TRANSMISSION LINE SURVEY****2.2****TOWER FOUNDATION, ERECTION, STRINGING
AND INSTALLATION OF LINE MATERIALS**



EPC

Project

**108.4 MW (GROSS) CCPP AND
UPGRADE WORKS OF 33KV
NETWORK, AT REPUBLIC OF
SIERRA LEONE**

**Document
Title**

**TECHNICAL SPECIFICATION FOR
TRANSMISSION LINE SURVEY
WORKS**

Document Number

SP-E0018-CEE-ETL-TS-0002

Revision


R0

Sheets

3 OF 19

SECTION – 1.0

GENERAL TECHNICAL SPECIFICATION

	Project	108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE	Document Title	TECHNICAL SPECIFICATION FOR TRANSMISSION LINE SURVEY WORKS		
				Document Number	SP-E0018-CEE-ETL-TS-0002	Revision

1.0.0 INTENT OF SPECIFICATION

1.1.0 CECA SL Generation Limited (Employer) is developing a power generation complex in an industrial area of Freetown, Sierra Leone. This Power Generation Project will consist of combined cycle gas turbine (CCGT) power blocks with a 108.4-megawatt (MW) gross output. The CCGT power block will be fueled by Liquefied Petroleum Gas (LPG) delivered by barge from the New Kissy Jetty,

1.2.0 The transmission line requirement shall be of two phases:

a) **Part 1:** Generated Power shall be evacuated through two transmission lines.

- i. **Line 1** - This transmission line commences from Kissy Project Power Station at Sierra Leone, which runs in west direction to the power station, along the Bai Bureh Road and terminates at Cline town Substation. This transmission line spans around 4.5 km. (Refer ANNEXURE:B Figure 1).

Conductor type – 265 sq. mm, AAC conductor/ OPGW- 32 cores (G652-B1)

Cable - 1CX630SQMM AL (UG) XLPE,FRLS power cable /PH

- ii. **Line 2** - This transmission line commences from Kissy Project Power Station at Sierra Leone, which runs in east direction to the power station, along the Bai Bureh Road and terminates at Wellington Substation. This transmission line spans around 8.5 km. (Refer ANNEXURE:B Figure 2).

Conductor type – 265 sq. mm. AAC conductor / OPGW- 32 cores (G652-B1)

Cable - 1CX630SQMM AL (UG) XLPE,FRLS power cable /PH.


- b) **Part 2:** There is an existing 33 kV transmission line spanning 600 m approximately inside the proposed Power Generation Project land area (Refer ANNEXURE:B Figure 4). Two (2) terminal towers will be mounted inside the project site in the East and West corner of the plant to terminate the double circuit line along with Lightning Arrestors in each circuit in order to form the Line in and Line out (LILO) arrangement. This 33kV lines will have transition to underground cable and will be routed to the indoor 33kV switchgear located in the EDSA building inside the plant boundary.

1.3.0 This specification covers the requirements for survey work of. of Part 1 and 2 described above.

1.4.0 The general terms and conditions, instruction to bidders and other attachments referred to elsewhere be hereby made part of the technical specification. The Bidder's offer shall conform to all requirements stipulated in the specification

2.0.0 SCOPE OF SERVICES

- I. The scope of work covers survey and tower spotting,

	Project 108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE	Document Title TECHNICAL SPECIFICATION FOR TRANSMISSION LINE SURVEY WORKS			
			Document Number SP-E0018-CEE-ETL-TS-0002	Revision R0	Sheets 5 OF 19

Part 1 - Two numbers of double circuit rising transmission towers from the 108.4 MW (CCPP) Power Plant to Cline town & Wellington substation.

2.1.0 **Part 2** – Identification of Cable riser tower at east and west side of the plant boundary for terminate the existing overhead transmission line ropoti-blackhall substation, as we need to remove the existing transmission line which is passing through the plant plot. The rerouting is proposed through UG cable which will be connected to the EDSA PDC located at Northern side of the plant boundary.

2.2.0 The scope of work includes the following:

- I. Geotechnical Investigation shall be carried out by the bidder in view of tower foundation design as well as earthing design.
- II. Detailed survey with GPS enables kits, Total Station etc. including preparation of BEE line, reports with all necessary details as asked in particular section under this specification, Check survey and tower location marking, soil resistivity measurement.

3.0.0 TIME SCHEDULE

The following shall be the schedule for completion of work for this package which shall be from the date of issue of order:

Work	Schedule
i) Part 1 - Survey, from the Power Plant to Cline town & Wellington substation. Line 1 - 4.5 km Line 2 - 8.5 km	1 month from date of LOI/ workorder This will be finalized during commercial meeting.
ii) Part 2 - Identification of Cable riser tower at east and west side of the plant boundary for terminate the existing overhead transmission line ropoti-blackhall substation	1 month from date of LOI/ workorder This will be finalized during commercial meeting.


4.0.0 DRAWINGS, DATA AND MANUAL

11.1.0 To Be Submitted Along with Bid :

- Technical offer
- Technical schedules duly filled up and stamped and signed on all the sheets.

11.2.0 To Be Submitted After Award of Contract:

The minimum requirements of data, drawings and instruction manuals for this package as listed below, in addition to the requirements of various clauses of Technical Specification, and other applicable Sections to be submitted in multiple copies to the Employer/Sub contractor All communications in the drawings, documentations, technical literatures and manuals will be in English language. The Bidder shall prepare an exhaustive Master Drawing List (MDL) of all drawings/documents/ manuals to be submitted during execution stage (including those from sub-Bidders). The MDL shall contain drawing/document no., rev. no, title, scheduled date of submission,

	Project	108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE	Document Title	TECHNICAL SPECIFICATION FOR TRANSMISSION LINE SURVEY WORKS		
Document Number	SP-E0018-CEE-ETL-TS-0002		Revision	R0	Sheets	6 OF 19

actual date of submission, approval status (Category & date), etc. The exact format shall be as approved by Employer. The Bidder shall furnish the MDL to Employer before Notification of Award (NOA). This shall be discussed and finalized during pre-award discussions. The MDL will be modified by Bidder periodically to take care of execution requirements. The MDL shall be submitted by Bidder for contractor information every month with latest status.

- Master Work Plan / Schedule
- Detail Survey report and profile drawings showing ground clearance and tower locations.
- Tower Schedule and foundation classification for individual tower locations.

11.3.0 Drawing / documents distribution schedule will be fired-up during finalization of Contract.

11.4.0 For all technical tables and diagrams, calculation results, drawings, test data and scales adopted in the design, the Standard International unit system (SI) as per International Standardization Organization (ISO) shall be uniformly employed.

11.5.0 All engineering documents and drawings shall be of international "A" series sizes (A0, A1, A2, A3 and A4).

11.6.0 All engineering drawings shall be supplied as AutoCAD soft copies. Auto Cad copies of all tower point and important junction point to be marked on GPS co-ordinate for future smooth execution.

11.7.0 Wherever exist any obstruction details of the same along with resolution plan to be provided by bidder for purchaser's onward action.

11.8.0 All calculation (except special design software) shall be provided in excel file, list, schedules shall be provided in excel file.

**EPC**

Project

108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE

Document Title

TECHNICAL SPECIFICATION FOR TRANSMISSION LINE SURVEY WORKS

Document Number

SP-E0018-CEE-ETL-TS-0002

Revision


R0

Sheets

7 OF 19

ANNEXURE-A: PROJECT INFORMATION

Description	Parameters	
Project Title	108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE	
Location	Near Kissy Dockyard, Freetown, Sierra Leone	
Employer	CECA SL Generation Limited	
Nearest Airport	Lungi International Airport, Lungi	
Nearest Sea Port	The Freetown Port (Queen Elizabeth II Quay)	
Road Access	Available in good condition	
Fuel	Liquefied Petroleum Gas (Propane, Normal operation) Diesel Fuel Oil (Rare use)	
Elevation:	33 m – 40 m Mean Sea Level	
Seismic data (as per EN 1998)	Peak Ground Acceleration = 0.08g m/s ² - 10% probability of exceedance in 50 years, 475-years return period. Importance class = 2 Response Spectra Type = II Behaviour Factor = 1.5 for Steel Structures.	
Temperature	Maximum temperature	35°C
	Minimum temperature	20°C
Precipitation:	Design Rainfall	75 mm/hr
Wind Design (Based on EN 1991-1-4)	Fundamental value of the basic wind velocity, $V_{b,0} = 30.9$ m/s Terrain Category = 0 Remaining parameter as per EN 1991-1-4	
Relative Humidity	Design	70%
	Daily Average during January:	58%

	Project	108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE	Document Title	TECHNICAL SPECIFICATION FOR TRANSMISSION LINE SURVEY WORKS		
Document Number	SP-E0018-CEE-ETL-TS-0002		Revision	R0	Sheets	8 OF 19

ANNEXURE- B:

1. ROUTE MAP OF PART 1 & 2



Figure 1: Proposed 33 kV Cline town Transmission line route

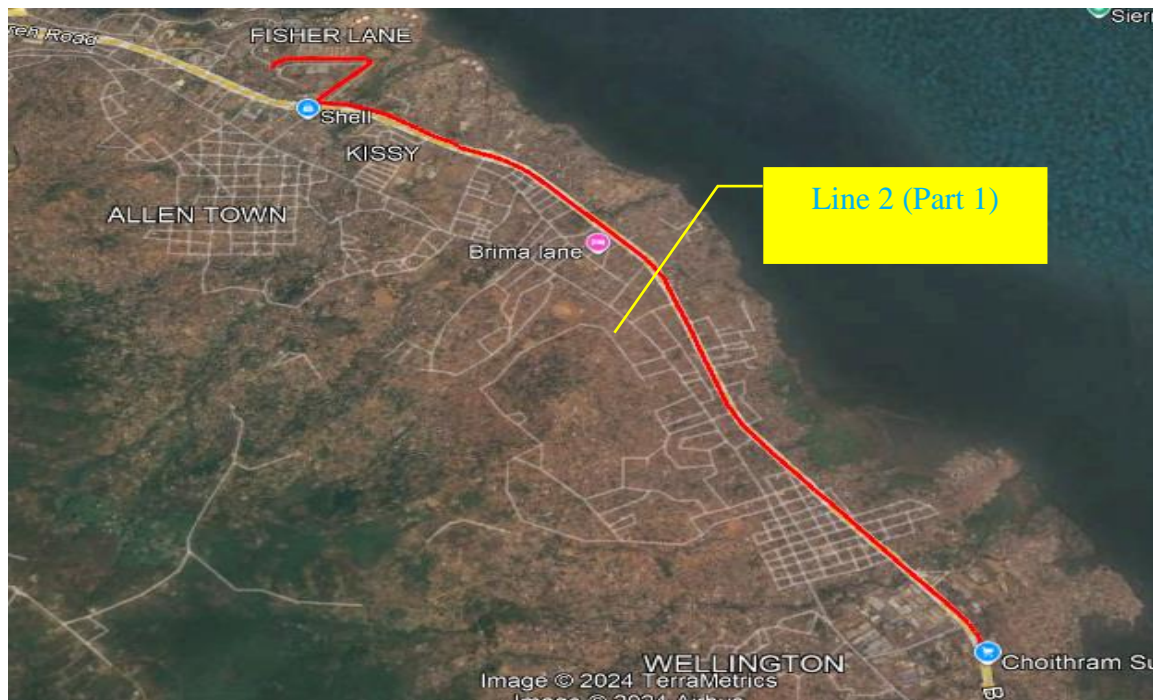


Figure 2: Proposed 33 kV Wellington Transmission line route



EPC

Project

**108.4 MW (GROSS) CCPP AND
UPGRADE WORKS OF 33KV
NETWORK, AT REPUBLIC OF
SIERRA LEONE**

**Document
Title**

**TECHNICAL SPECIFICATION FOR
TRANSMISSION LINE SURVEY
WORKS**

Document Number

SP-E0018-CEE-ETL-TS-0002

Revision

R0

Sheets

9 OF 19



Figure 3: Proposed land for Power Generation Project



Figure 4: Existing 33 kV Transmission line



Project	108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE	Document Title	TECHNICAL SPECIFICATION FOR TRANSMISSION LINE SURVEY WORKS		
Document Number	SP-E0018-CEE-ETL-TS-0002	Revision	R0	Sheets	10 OF 19

SECTION – 2.0

33KV TRANSMISSION LINE SURVEY



Project	108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE	Document Title	TECHNICAL SPECIFICATION FOR TRANSMISSION LINE SURVEY WORKS		
Document Number	SP-E0018-CEE-ETL-TS-0002	Revision	R0	Sheets	11 OF 19

TABLE OF CONTENTS

1.0.0	ROUTE ALIGNMENT	12
2.0.0	DETAILED SURVEY	13
3.0.0	GEOTECHNICAL INVESTIGATIONS	18
4.0.0	STATUTORY REGULATIONS AND STANDARDS	18

**EPC****Project****108.4 MW (GROSS) CCPP AND
UPGRADE WORKS OF 33KV
NETWORK, AT REPUBLIC OF
SIERRA LEONE****Document
Title****TECHNICAL SPECIFICATION FOR
TRANSMISSION LINE SURVEY
WORKS****Document Number****SP-E0018-CEE-ETL-TS-0002****Revision****R0****Sheets****12 OF 19**

1.0.0 ROUTE ALIGNMENT

1.1.0 Route Alignment shall be done using satellite imageries relevant topographical maps. In case the required topographical maps are available in digitized form, the same shall be procured and used by the Sub-Contractor. Google Imageries shall also be used route alignment. The sub-contractor shall suggest the route alignment between the terminal points in the prescribed route corridor by the Employer/Contractor.

1.2.0 Requirement of Transmission Line Routing:

- a) The alignment of the transmission line shall be most economical from the point of view of construction and maintenance. But, the sub-contractor shall consider only the corridor prescribed by the Employer for the transmission line.
- b) Routing of transmission line through protected /reserved corridor should be only considered.
- c) Bidder shall consider the route of transmission line with road crossings wherever applicable within the Employer/Contractor identified line corridor.
- d) The route should have minimum crossings of overhead EHV power lines and communication lines as much as possible.
- e) The number of angle points shall be kept to a minimum considering the identified transmission line corridor.
- f) The distance between the terminal points specified shall be kept shortest possible, consistent with the terrain that is encountered and shall be within provided corridor by the Employer/Contractor.
- g) Marshy and low-lying areas, salt marshes and earth slip zones within the identified corridor shall be avoided to minimize risk to the foundations and towers.
- h) It would be preferable to utilize level ground for the alignment.
- i) Crossing of power lines shall be minimum. Alignment shall be kept at a specified distance from existing lines considering Right of Way (ROW) and tower falling distances.
- j) Crossing of communication lines shall be minimized and it shall be preferably at the right angle. Proximity and parallelism with telecom lines shall be eliminated to avoid danger of induction to them.
- k) Areas subjected to flooding such as natural river/strom water , if any shall be avoided.
- l) Restricted areas such as civil and military airfields shall be avoided. Care shall also be taken to avoid aircraft landing approaches, thus recommended not consider beyond the identified corridor.
- m) All alignments should be easily accessible both in dry and rainy seasons to enable maintenance throughout the year as much as possible within the identified corridor.
- n) Angle points should be selected such that shifting of the points within 100 m radius is possible within the identified corridor at the time of construction of the line.
- o) The areas requiring special foundations and those prone to flooding should be avoided to the extent possible.

**EPC**

Project

**108.4 MW (GROSS) CCPP AND
UPGRADE WORKS OF 33KV
NETWORK, AT REPUBLIC OF
SIERRA LEONE**Document
Title**TECHNICAL SPECIFICATION FOR
TRANSMISSION LINE SURVEY
WORKS**

Document Number

SP-E0018-CEE-ETL-TS-0002

Revision

R0


Sheets

13 OF 19

- 1.3.0 For examination of the of the most appropriate route within identified corridor, besides making use of information's /data /details available/extracted through Topographical maps, Google Images and computer- aided processing of satellite imagery, the sub-contractor shall also carry out reconnaissance /walk over survey/ preliminary survey as may be required for verification & collection of additional information/data/details.
- 1.4.0 The sub-contractor shall submit his preliminary observations & suggestions along with various information's/data/details collected and processed satellite imagery data, topographical map data marked with the route within the Employer identified corridor. Digital terrain modeling using contour data from topographical maps as well as processed satellite data shall be done by the contractor for the route. A fly through perspective using suitable software(s) shall be developed for further refinement of the selected route, if required. Site visit and field verification shall be conducted by the Contractor jointly with the Contractor representative for the proposed route alignment within the identified corridor.
- 1.5.0 Final digitized route alignment drawing with latest topographical and other details/features including all natural canals / river, roads etc. up to maximum **1.0km** on either side of selected route alignment shall be submitted by the sub-Contractor for Employer's/Contractor's approval along with report containing other information/details as mentioned above. Changes in the route alignment, if any, during detailed surveys, shall be incorporated in the final digitized route alignment drawing.
- 1.6.0 The sub-contractor must take all possible precautions to avoid legal proceedings.
- 1.7.0 Sub-Contractor shall have to arrange for all approvals from concerned authorities like, Railway crossing, Highway Crossing, Electrical inspectorate, Defense Air traffic safety, Forest department, Power lines crossings of various authorities, Airport authority, Public Works Department (PWD), and related departments.
- 1.8.0 Sub-Contractor must issue notice to the land Employer, wherever required and whenever circumstances arise, prior to execution of work. The draft of the notice will be approved by Contractor/Purchaser. Necessary details like surveys, address of land Employer/occupier etc. required for serving the notice are to be collected by sub-contractor at their cost if necessary.
- 1.9.0 Sub-Contractor shall have to take all advance actions to sort out the problems of right of way (ROW), way clearance, clearing of any objection from farmer, land Employer, occupier, and or any other objection and payment of compensation against any damages to crops/trees and or any other damage etc. all along the line route and corridor.

2.0.0 DETAILED SURVEY

- 2.1.0 The detailed survey shall be carried out using DGPS, Total Stations, digital theodolites etc. along with the approved route alignment. As an alternative, the sub-contractor may also use ALTM (Air borne Laser Terrain Modeling) techniques of equal or better accuracy for the detailed survey.
- 2.2.0 **Soil resistivity**, along the route alignment shall be measured in dry weather by four electrode methods keeping inter-electrode spacing of 50 meters. For calculating soil resistivity formula $2 \pi a r$ (where $a = 50$ m and $r =$ megger reading in ohms) shall be adopted. Measurement shall be made at every 2 KM along the length of route. In case the soil characteristics changes within 2 KM, values shall have to be measured at intermediate locations also. Megger reading and soil characteristics should also be indicated in the soil resistivity results.
- 2.3.0 **Route Marking**

	Project	108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE	Document Title	TECHNICAL SPECIFICATION FOR TRANSMISSION LINE SURVEY WORKS		
				Document Number	SP-E0018-CEE-ETL-TS-0002	Revision

- a) The route of the transmission line shall be recorded using DGPS of positional accuracy less than 3mtr.
- b) The co-ordinates of all the angle points as well as other important crossings, landmarks etc. shall be recorded using DGPS for easy relocating. In addition, the angle point locations etc shall be marked using marking stones of size 200 x 200 x 1000 mm including supply of marking stones, with approved marks including painting above the ground level and yellow lettering and marking the direction of incoming and outgoing lines are to be marked clearly on the top with red color. If the distance between such anchor points is more than 1KM one more directional stone is to be fixed. So also, for the road crossings and river / canal crossings on both sides.
- c) At the starting point of the commencement of route survey, the coordinates shall be recorded. The co-ordinates of the location of the survey instrument shall also be recorded. Further, the co-ordinates at prominent position at intervals of not more than 500 mtr. along the transmission line to be surveyed up to the next angle point shall also be recorded. Wherever the line alignment crosses the EHT line, P & T line or roads, the Sub-contractor shall record co-ordinates on the points of crossing. Wherever line route alignment passes over permanent landmarks such as rock, boulders, culverts etc. suitable white paint marks with directional and Employer's markings shall be made and co-ordinates recorded.

2.4.0 Profiling

- a) The complete profiling along the route shall be carried out using modern surveying equipment viz, total stations, DGPS, digital theodolite, long range scanners etc. Reference levels at every 20 meters along the route are to be recorded. In case of hilly terrain/undulations, RL shall also be measured for 10mtr on either side of center line in lateral direction (perpendicular to the line). R/L's at other undulations along the route as well as in the route plan and other enroute details viz. Crossings, building & structure, trees & other infrastructure etc. shall also be recorded. Areas along the route, which in the view of the sub-contractor, are not suitable for tower spotting, shall also be marked.
- b) The complete profiling details shall be digitized, and the data shall be prepared & stored in the format compatible to computer-aided tower spotting software.
- c) A printed/plotted output of the digitized profiling shall be submitted by the sub-contractor to Employer's site-in-charge for review before taking up computer-aided tower spotting.

2.5.0 Optimization of Tower Location/Tower Spotting

- a) Optimization of tower locations shall be done by the sub-contractor using computer- aided tower spotting software- PLS-CADD. To verify the results of computer aided tower spotting, **the sub-contractor shall furnish sample calculations and manual tower spotting drawings for some typical sections.**
- b) The sag-tension characteristics of the conductor as well as tower spotting data shall be furnished by the subcontractor for the Employer's/contractor's approval before execution. Sag template curves, shall be prepared by the sub-contractor on acrylic sheet indicating cold curve, hot curve, ground clearance curve and support footing curve and the same shall be submitted to the Contractor.

2.6.0 Tower Spotting.

Optimizations of tower locations shall be done by the sub-contractor using computer aided tower spotting software - PLSCADD and shall furnish sample calculations and manual tower spotting drawings for some typical sections. PLSCADD software shall be made available at regional office of the Employer and limited access can be made available to the sub-contractor for the same.

**EPC**

Project

**108.4 MW (GROSS) CCPP AND
UPGRADE WORKS OF 33KV
NETWORK, AT REPUBLIC OF
SIERRA LEONE**Document
Title**TECHNICAL SPECIFICATION FOR
TRANSMISSION LINE SURVEY
WORKS**

Document Number

SP-E0018-CEE-ETL-TS-0002

Revision

R0

Sheets

15 OF 19

While profiling and spotting the towers the following shall be borne in mind.

a) Span:

The maximum length of a section shall be **sum of 10 spans**. A section point shall comprise of tension Tower, as applicable. The normal span, Wind Velocity and Seismic Zone considerations shall be considered as per the relevant **IEC standard**.

b) Extension / Truncation

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 body/leg extension. In case of locations where the ground clearance is available, truncated towers may be spotted. The provisions kept in the design of towers with respect to body /leg extensions, truncations shall be considered by the sub-contractor during execution stage.

c) Loading

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 an uplift is unavoidable, it shall be examined if the same can be overcome by adding standard body extensions to the towers failing which tension towers designed for the purpose shall be employed at such positions.

d) Road Crossing

At all important road crossings, the tower shall be fitted with double suspension or tension insulator strings depending on the type of tower but the ground clearance at the roads under maximum temperature and in still air shall be such that even with conductor broken on adjacent span, ground clearance of the conductor from the road surfaces shall not be less than the values mentioned in the IEC standard.

e) Railway Crossings

In case of rail track crossings, the minimum height above rail level of the lowest portion of any conductor under conditions of maximum sag, shall be in accordance with the regulations of the relevant IEC codes/standards.

f) Power line Crossings

Where the transmission line for both Part 1 & 2, is to cross over another line of the same voltage or lower voltage, large angle type tower with suitable extensions shall be used. Provisions to prevent the possibility of its crossing other overhead lines shall be made.

The angle of crossing has to be preferably 90 degrees and at any time should not be below 60 degrees.

g) Telecommunication Line Crossings

The angle of crossing shall be as near to 90 degrees possible. However, deviation to the extent of 30 degrees may be permitted under exceptionally difficult situations.

**EPC**

Project

**108.4 MW (GROSS) CCPP AND
UPGRADE WORKS OF 33KV
NETWORK, AT REPUBLIC OF
SIERRA LEONE**Document
Title**TECHNICAL SPECIFICATION FOR
TRANSMISSION LINE SURVEY
WORKS**

Document Number

SP-E0018-CEE-ETL-TS-0002

Revision

R0

Sheets

16 OF 19

When the angle of crossing has to be below 60 degrees, the matter will be referred to the authority in-charge of the telecommunication System and the permission of the telecommunication authority to be obtained by the sub-contractor.

Also, in the crossing span, power line support will be as near the telecommunication line as possible, to obtain increased vertical clearance between the wires.

h) Details Enroute

All topographical details, permanent features, such as trees, bushes / roads, land survey nos. etc., **15 meters. on either side** of the alignment should be detailed on the profile plan. All the topographical details (trees, bushes, permanent structures, including open land) survey no. wise shall be included in the report.

2.7.0 Clearance from Ground, Trees etc.

Clearance from ground, buildings, trees and telephone lines shall be provided in conformity with the relevant European Codes/standards as amended up to date.

- a) The Sub-Contractor shall estimate/enumerate numbers of trees that are to be cut within the rights of way of transmission line along the proposed route alignment. Sub-Contractor may please note that Contractor will not pay any compensation for any loss or damage to the properties or for tree cutting due to Sub-Contractor's survey work.
- b) The trees and bushes existing within **Right of Way (ROW)** shall be estimated/enumerated by the Sub-contractor and marked with quality paint serially from angle point 1 (One) onwards.
- c) The bushy and undergrowth encountered in the **Right of Way (ROW)** of the central line alignment should also be evaluated with its type, height and girth clearly indicating in the tree /bush statement. The tree/bush statement should also approximately indicate the percentage area within right of way where tree/bush exist.
- d) The sub-contractor shall also intimate the contractor, his assessment about the likely no. of tree & crop.
- e) The Sub-contractor shall also identify the **non-forest / deemed forest / private land / Government land** areas involved duly authenticated by concerned authorities.
 - i. A statement of forest areas with survey/compartments nos. (all type of forest /RF /PF Acquired forest/ Revenue forest/Private forest/forest as per dictionary meaning of forest etc.)
 - ii. A statement of non-forest areas with survey/compartments nos.
 - iii. Tree cutting details (Girth wise & species wise).
 - iv. Marking of forest areas with category on topographic sheets 1:250,000 showing complete line route, boundaries of various forest divisions and their areas involved.
 - v. Village forest maps of affected line and affected forest areas and marking of the same.
 - vi. Forest division map showing line and affected forest areas.
 - vii. The sub-contractor shall furnish the village Revenue survey map duly mentioning the survey nos., name of the Employer along the proposed corridor width.
 - viii. The village Revenue survey map is to be certified by Govt. Surveyor and countersigned by Revenue Inspector/Village Accountant.
 - ix. The village Revenue survey map is to be digitized, and Geo referenced and superimposed on the selected corridor duly indicating the survey no of lands coming under the corridor.
- f) The sub-contractor shall finalize the forest clearance proposal on the prescribed format duly completed in all respects and get to clearance from the forest department.

**EPC**

Project

**108.4 MW (GROSS) CCPP AND
UPGRADE WORKS OF 33KV
NETWORK, AT REPUBLIC OF
SIERRA LEONE**Document
Title**TECHNICAL SPECIFICATION FOR
TRANSMISSION LINE SURVEY
WORKS**

Document Number

SP-E0018-CEE-ETL-TS-0002

Revision

R0

Sheets

17 OF 19

2.8.0 Preliminary Schedule

The profile sheets showing the locations of the towers together with preliminary schedules of quantities indicating tower types, wind & weight spans, angle of deviation, crossing & other details etc. shall be submitted by the sub-contractor for review & approval by Employer's site-in-charge.

2.9.0 Detailed Survey of Tower Locations.

- a) The detailed survey shall be conducted to spot the tower locations on ground conforming to the approved profile and tower schedule.
- b) The co-ordinates of all the tower locations shall also be recorded using DGPS of positional accuracy less than 3mtr. For easy relocation, the position of all tower locations shall be marked in the final digitized route alignment drawing with relative distance from any permanent benchmark in the area.
- c) The sub-contractor shall also collect required data at each tower location in respect of soil strata, ground water level, history of water table in adjacent areas/surface water and classify the suitable type of foundation at each location and detailed soil investigations carried out at selected locations etc.

2.10.0 Contouring at undulated locations, if any

- a) The levels up or down of each pit center with respect to center of tower location shall be recorded at intervals of **2 mtrs** using total stations / DGPS / digital theodolite and digitized contour plans shall be made. Based on the digitized elevation plans, the quantities of benching & protection work vis-a-vis possible unequal leg extensions shall be optimized using suitable computer-aided techniques/ software's. Required tower and foundation details, cost data for comparative evaluation of benching & protection work vis-a-vis unequal leg extensions shall be provided by the sub-contractor to the Employer before execution stage.

2.11.0 The changes desired by the Employer in the preliminary tower schedule or as may be required based on detailed survey of tower locations & contouring by the sub-contractor, shall be carried out **by the sub-contractor and the final tower schedule shall be submitted for approval of Employer**. The tower schedule shall show the position of all type of towers, span length, type of foundation for each tower, benching & revetment requirement, unequal leg extensions, deviation at all angles, crossing & other details etc.

2.12.0 Survey Methodology & Precision

- a) All elevations shall be referred to established benchmarks. Leveling operations shall begin and end at benchmarks approved by the Contractor.
- b) In the absence of suitable benchmarks, the leveling shall be done by two independent leveling parties working in opposite directions along the same line. The difference in elevations between the two surveys shall not exceed the precision required for 3rd order surveys as stated above.
- c) All-important objects and features along the transmission line centerline (railways, highways, roads, canals, rivers, transmission lines, distribution lines, telephone lines etc.) shall be surveyed and located with a positional accuracy of 1:2000 between points of known horizontal position.

2.13.0 Survey Report

**EPC**

Project

**108.4 MW (GROSS) CCPP AND
UPGRADE WORKS OF 33KV
NETWORK, AT REPUBLIC OF
SIERRA LEONE**Document
Title**TECHNICAL SPECIFICATION FOR
TRANSMISSION LINE SURVEY
WORKS**

Document Number

SP-E0018-CEE-ETL-TS-0002

Revision

R0

Sheets

18 OF 19

- a) Complete BOQ of the transmission lines as per the technical specifications shall be furnished in the survey report.
- b) Each angle point locations shall be shown with detailed sketches showing existing in the close vicinity permanent landmarks such as specific tree(s), bushes, electric pole/tower, telephone pole/tower, canal / natural nala, roads etc. The relative distance of landmarks from the angle points and their bearings shall be indicated in the sketch. These details shall be included in the survey report.
- c) Information w.r.t. infrastructure details available enroute, identification and explanation of route constraints, etc. shall also be furnished in the Survey report and shall inter-alia include the following:
- i. Information regarding infrastructural facilities available along the final route alignment like access to roads, construction material sources (like quarry points for stone, sand and availability of construction water), labor, existing transport facilities, fuel availability etc. shall be furnished in the survey report.
 - ii. All observations which the sub-Contractor thinks would be useful to the construction of the transmission lines mentioned under scope of work are to be reported.
 - iii. Suggestions regarding the number of convenient zones (line segments/portions) in which the entire alignment can be divided keeping in view the convenience of line construction, operation, maintenance etc. are to be given.
 - iv. Suggestions regarding location for setting up stores during line construction in consultation with Employer representatives shall also be provided by the sub-Contractor.
 - v. Working months available during various seasons along with the final route alignment, with period, time of monsoon, sowing & harvesting of different type of crops and the importance attached to the crops shall be stated by the sub-Contractor.
 - vi. The line may require clearance from various authorities. The sub-Contractor shall indicate the portion of the line so affected, the nature of clearance required and the name of concerned organizations such as local bodies, municipalities, P&T (name of circle), Inland navigation, Irrigation Department, any other authorities etc.
- d) All the requisite data for processing the case of statutory clearances such as Forest and Highway Authority shall be provided along with the report.
- e) The sub-contractor shall also collect & report details pertaining to pollution levels envisaged along the transmission line.

3.0.0 GEOTECHNICAL INVESTIGATIONS

3.1.0 The geo-technical investigation shall be carried out by the bidder.

4.0.0 STATUTORY REGULATIONS AND STANDARDS

4.1.0 The Sub-Contractor is required to follow statutory regulations stipulated in IEC Codes/standards and other local rules & regulations.

4.2.0 The codes and standards referred to in these specifications shall govern. In case of a conflict between such codes/standards and these specifications, the stringent shall prevail. Such codes and standards referred to shall mean latest revisions, amendments, changes adopted and published by relevant agencies.

4.3.0 Other Internationally acceptable standards which ensure equivalent or better performance than those specified shall also be acceptable.



Project	108.4 MW (GROSS) CCPP AND UPGRADE WORKS OF 33KV NETWORK, AT REPUBLIC OF SIERRA LEONE	Document Title	TECHNICAL SPECIFICATION FOR TRANSMISSION LINE SURVEY WORKS		
Document Number	SP-E0018-CEE-ETL-TS-0002	Revision	R0	Sheets	19 OF 19