

SECTION-I B

GENERAL INFORMATION

TECHNICAL SPECIFICATIONS

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TECHNICAL SPECIFICATIONS

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GENERAL INFORMATION

1.0 General Information

- 1.1 (a) For towers, pole structures & foundations (including pile foundations) to be designed by the Contractor, Contractor shall develop structural drawings, shop drawings & Bill of Materials of all transmission line towers/ pole structures and their extensions in the present project. The copyright in all drawings, documents and other materials containing data and information for such design(s) to be developed by the Contractor or through any third party under this Contract shall remain vested in the Employer for a period of 5 years from the date of Completion of the Contract. In case the Contractor intends to use these design(s) for any purpose other than for project(s) to be executed by POWERGRID prior to the period of 5 years as above, the Contractor shall obtain a written permission from POWERGRID to this effect. The permission shall be granted or otherwise by POWERGRID keeping in view the specifics of the case and POWERGRID shall be sole judge in this regard.

In case any breach of the aforesaid provisions of copyright during the copyright retention period comes to the notice, POWERGRID shall take the action as deemed fit keeping inter-alia under the provisions of the Integrity Pact.

- (b) The Contractor may also use previously tested tower/ pole structure designs and associated foundation designs (including pile foundation designs) meeting specification requirements, which have been designed by them for any other project of POWERGRID, having copyright retained thereof with POWERGRID, without any financial implication and without any written permission from POWERGRID as per para (a) above.
- (c) In case the Contractor uses previously tested tower/ pole structure and associated foundation designs (including pile foundation designs) meeting specification requirements, developed by the Contractor for any other utility/ developer, POWERGRID shall be free to use designs and reproduce all drawings, documents and other material for the purpose of the Contract including, if required, in its any other project and for operation and maintenance, without any financial implication.

No recovery/ additional payment on account of design/ testing shall be made in case of use of tested designs meeting specification requirements.

Also, all the drawings indicated at above (a) & (b) shall carry the following statement and shall be displayed conspicuously on the drawing:

WARNING: THIS IS PROPRIETARY ITEM AND DESIGN RIGHT IS STRICTLY RESERVED WITH POWERGRID UNDER NO CIRCUMSTANCES THIS DRAWING SHALL BE USED BY ANYBODY WITHOUT PRIOR PERMISSION FROM POWERGRID IN WRITING.

- 1.2 For towers/ pole structures* & foundations to be designed by the Contractor, during execution of the project, if any specific designs viz. Transposition tower, body extensions other than that specified in the BPS, other equal/ unequal leg extensions, cross-arm strengthening, auxiliary cross-arms, raised chimney foundations etc. are required as per site conditions, the contractor shall be required to develop the corresponding structural drawings, BOM & Shop drawings, Foundation drawings etc. without any financial implication to Employer. The drawings/ BOMs developed by the Contractor shall be submitted to the Employer for approval.
- 1.3 For Employer design towers/ pole structures, Employer shall provide structural drawings, shop drawings & Bill of Materials of all type of standard transmission line towers/ pole structures and their extensions, river crossing towers/ special towers as required to the Contractor after placement of award, in sequence, suiting the project requirement. The drawings for all type of foundations for these towers/ pole structures shall also be provided by Employer to the Contractor.

However, if the contractor has already executed/is executing any other POWERGRID project involving same type & design of towers as required under the present package, POWERGRID shall not provide the drawings, BOM and Shop sketches again and confirmation regarding the applicability of the same for present package shall be given.

- (a) **For towers, pole structures & foundations to be designed by the Contractor**, the provisional quantities of fabricated & galvanized steel towers as per specifications requirement, foundation type and their numbers, quantity of various line materials and other items are given in appropriate Schedule of Bid Proposal Sheet (BPS) for respective packages.

For Employer design towers/ pole structures, the provisional quantities of fabricated & galvanized steel parts required for towers, concrete, excavation volume & reinforcement steel for foundation and other items are given in appropriate Schedule of Bid Proposal Sheet (BPS) for respective packages.

However, the work shall be executed as per approved construction drawings and project requirement.

- (b) The various items of work are described very briefly in the appropriate Schedule of BPS. The various items of the BPS shall be read in conjunction with the corresponding sections in the Technical Specifications including amendments and, additions, if any. The Bidder's quoted rates shall be based on the description of activities in the BPS as well as other necessary

operations required to complete the works detailed in these Technical Specifications.

- (c) The Unit rates quoted shall include minor details which are obviously and fairly intended, and which may not have been included in these documents but are essential for the satisfactory completion of the various works.
- (d) The unit rate quoted shall be inclusive of all plant equipment, men, material skilled and unskilled labour etc. essential for satisfactory completion of various works.
- (e) All measurements for payment shall be in S.I. units, lengths shall be measured in meters corrected to two decimal places. Areas shall be computed in square meters & volume in cubic meters, rounded off to two decimals.

- 1.4 Bidder shall quote the unit rates for various items of towers/ pole structures and foundations as per units mentioned in appropriate schedule of (BPS). However, payment of these items identified in the schedule of prices shall be made as follows:

TOWER

Supply items : On supply of respective complete tower/ pole structure

Erection items : On erection of respective complete tower/ pole structure

Foundation items : On completion of respective foundation in all respect

For towers, pole structures & foundations specified in BPS to be designed by the Contractor, the payment shall be based on unit prices quoted by the bidder, irrespective of the weights/ volumes arrived in design finally approved by the Employer. For any tower or supplemental/ additional works related to tower/ pole structure/ foundation not specified in the Contract Agreement, but authorised by the Employer, the payment shall be made to the Contractor as detailed in **Section-IV** of this volume. However, Price variation applicable as per SCC shall apply for towers & foundations.

For towers/ pole structure/ foundation designed by the Employer & covered under BPS, payment to be made for towers/ pole structures/ foundations shall be worked out based on the unit rates and approved Bill of Materials (BOM) for towers/ pole structures and quantities/ volumes as per approved foundation drawings.

For other Line materials supply items, payment & price variation shall be as per payment terms indicated in SCC.

The Contractor shall not keep supply items inventory of more than 3 months at any time at their stores.

Towers to be supplied by the contractors /Tower Manufacturers shall be dispatched Panel wise as per mutually agreed procedure with Employer Quality Assurance & Inspection Department.

- 1.5 Contractor shall clearly indicate in their offer, the sources from where they propose to procure various bought-out items in appropriate Schedule of BPS. The technical descriptions of these items are given in relevant sections of this Volume.

1.6

- i) All equipment/ materials/ items, as per **Annexure-A**, as applicable under present scope of works, shall be purchased only from class-I local Supplier meeting the specified minimum Local content (MLC).
- ii) Any imported equipment/ material/ item/ parts/ component to be supplied under the contract shall be tested in the certified laboratories to check for any kind of embedded malware/ trojans/ cyber threats and for adherence to Indian Standards as per the directions issued by Ministry of Power/ Govt. of India from time to time. In case of such import from specified “prior reference” countries, the requirement of prior permission from the Govt. of India including protocol for testing in certified and designated laboratories by Ministry of Power/ Govt. of India shall also be complied with by the Contractor.
- iii) The equipment offered by the Contractor shall at least conform to the requirements specified under relevant IS standard. In case of discrepancy between IS and other international standard, provisions of IS shall prevail. The Contractor shall also note that the list of standards presented in this specification is not complete. Whenever necessary, the list of standards shall be considered in conjunction with specific IS. If the IS standard is not available for an equipment/ material, then other applicable International standard (IEC/ Equivalent), as per the specification, shall be accepted.
- iv) The bidder/ Contractor shall list out the products and components producing Toxic e-waste under the contract and shall furnish to the Employer the procedure of safe disposal at the time of closing of the contract.

- 1.7 The Contractor shall take delivery of the Employer’s supplied materials at the stores established by the Contractor in consultation with the Employer and ensure their safe custody and shall install the same in the transmission lines as stipulated in this specification.

- 1.8 In case, part quantity of Tower/ Tower Parts/ Pole structures is supplied by the Employer or other Supplier, the contractor shall take delivery, carry out (unloading & stacking), ensure safe custody of materials at their stores including

insurance cover as required & install the same in the transmission lines as stipulated in this specification.

- 1.9 All the raw materials such as steel, zinc for galvanizing, reinforcement steel and cement for foundation, coke and salt for earthing etc. bolts, nuts, washers, step bolts, D-shackles, hangers, links, Danger Plates, Phase Plates, Pole Plates, number plates, Circuit Plates, aviation signals etc., required for transmission line tower/pole structure manufacture and erection shall be included in the Contractor's scope of supply. Bidder shall indicate in the offer, the sources from where they propose to procure the raw materials and the components.

1.10 Stringing

a) For Earthwire:

The entire stringing work of earth wire shall be carried out by standard stringing practice

b) For OPGW:

The entire stringing work of OPGW shall be carried out by power operated winch machines. No tractor shall be allowed for stringing of OPGW.

c) For transmission line with Single Conductor per phase:

The entire stringing work of conductor shall be carried out by standard stringing practice. No tractor shall be allowed for final sagging. The Contractor shall use power operated winch machines only

d) For transmission line with Bundle Conductor per phase:

The entire stringing work of conductor shall be carried out by tension stringing technique. The bidder shall deploy requisite number of TSEs as per following so as to meet the completion schedule

-Minimum 8Tonne capacity for 220kV Twin Bundle,

-Minimum 8Tonne capacity for 400kV Twin Bundle,

-Minimum 8Tonne capacity for 400kV Triple Bundle,

-Minimum 15Tonne capacity for Quad Bundle,

-Minimum 18Tonne capacity for Hexa Zebra Bundle and,

-Minimum 24Tonne capacity or double no. of TSEs of 15Tonne capacity for Hexa Lapwing Bundle Conductor.

The details regarding numbers and capacity of TSEs to be deployed shall be as mutually agreed between the Employer and Contractor. The period of

deployment of tension stringing equipment shall be as per actual site requirement. No tractor shall be allowed for final sagging.

To promote mechanization, for better safe working condition at site the Contractor shall mandatorily provide at site for each package (i) requisite numbers (minimum 2 nos. per TSE) of sagging bridges/ working platform with pull lifts for facilitating sagging & dead end jointing (ii) requisite numbers (minimum six nos. for each package) of power operated hydraulic/ motorized winch machines for tower erection & carrying out final sagging (iii) requisite numbers (minimum four) ladders with suitable hooks and attachment arrangement to facilitate worker movement on insulators strings and (iv) adequate number of walkie- talkies. In case more number of sagging bridges/ working platform, power operated winch machines etc. are required for stringing of transmission line in accordance with time schedule, the same shall be provided by the Contractor. Further, use of tractor for final sagging shall not be permitted. The Contractor shall use power operated hydraulic/ motorized winch machines only.

Power line crossing, river crossings, railway crossings, other single span sections where deployment of tension stringing machine is not warranted and in hilly terrain, thick forest or areas with site constraints, where deployment of tension stringing machine is not feasible, manual stringing may be adopted after getting approval of Employer's site Engineer. The contractor shall deploy appropriate tools/ equipments/ machinery to ensure that the stringing operation is carried out without causing damage to conductor/ earth wire/ OPGW which are installed at the prescribed sag-tension as per the approved stringing charts.

However, the Bidder having requisite experience may use helicopter for stringing. The Bidder intending to use helicopter shall furnish detailed description of the procedure, type & number of helicopter & accessories etc., to be deployed for stringing operation. Helicopters may be used in stringing processes, particularly in difficult and inaccessible terrain, subject to the required clearance from Director General of Civil Aviation (DGCA) / any other competent authority. The payment for stringing shall be done as per the unit rates of stringing under the contract irrespective of use of Helicopters for stringing.

However, in the Forest areas the stringing of pilot wires/ropes shall be carried out through drones only.

The Contractor may also deploy drones for stringing of pilot wires/ ropes for stringing, keeping in view site constraints as per the direction of Engineer-In-charge.

The quoted rate of stringing through drones shall be inclusive of all necessary T&P's required for successful completion of stringing work including deployment of drone of suitable capacity etc.

For use of Drones in stringing, clearance from Director General of Civil Aviation (DGCA) / any other competent authority may be obtained if required.

1.11 Access to the Line and Right of Way

Right of way and way leave clearance shall be arranged by the Employer in accordance with work schedules. Employer will secure way leave and Right of way in the Forest area.

1.12 Contractor Execution Plan

After award of the Contract, the Contractor shall submit a detailed plan for resources mobilization & execution of various activities under the project scope along with the L2 network (L2 network to be approved by CMG) to Site, CMG & Corporate Engineering. The detail should also cover the locations and size of stores to be established by the contractor.

2.0 Qualification Requirement for Contractor's Supplied Tower Parts and Line Materials

The Bidder should have assured access to supply the Conductor, Insulator, Earth wire, Hardware fittings, Accessories for Conductor & Earth wire and OPGW from Qualified Manufacturers meeting the following minimum requirements and must demonstrate that based on known commitments they will be available for use in the proposed contract.

All materials shall be procured from the POWERGRID approved firms which meet the respective qualifying requirements stipulated below. The Contractor shall finalize their sub-vendors/ manufacturers for supply of various line materials from amongst qualified firms within one month from date of NOA and submit the details in support of their meeting the stipulated qualification requirements.

In case Contractor proposes to supply the line material(s) from a sub-vendor/

manufacturer which is not already approved by POWERGRID, the same may be considered subject to following: -

- i) The proposal shall be given by Contractor along with complete details in support of suppliers' meeting the stipulated qualification requirements including details of past supplies, test certificates, performance certificates etc.
- ii) POWERGRID may carryout assessment of the works of the proposed suppliers, if required.
- iii) The final approval of the supplier shall be subject to verification of QR data and assessment of the supplier to the satisfaction of POWERGRID.

The review/ verification of QR data by POWERGRID/ assessment of supplier's works/ approval of the proposed supplier shall not in any way limit Contractor's responsibility or dilute their obligation of timely completion of supplies/ works. Any delays, what-so-ever, shall be entirely to Contractor's account.

- iv) Wherever the qualification requirement mentioned below stipulate requirement of providing additional warranty, the requisite CPG shall be submitted to POWERGRID regional HQ with intimation to Corporate Engineering department for subsequent review & approval of sub vendor drawings/ documents.

2.1 Tower Parts

The bidder/ Contractor should be a POWERGRID approved vendor of Tower and Tower Parts as on originally scheduled last date of bid submission or should have assured access from tower manufacturers approved by POWERGRID as on date of NOA-

In case of assured access from tower manufacturers, the Contractor shall furnish a Joint Deed of Undertaking (Format enclosed at **Annexure-B**) along with the manufacturer(s) to guarantee quality & timely supply of tower parts from each of the manufacturer(s) at the time of finalizing the manufacturer(s), during execution of the Contract.

2.2 Earthwire

The qualified manufacturer should have manufactured, tested and supplied at least three hundred (300) km of galvanized steel ground wire/ ACSR core wire of size 7/3.15mm or above.

2.3 OPGW

TECHNICAL EXPERIENCE

- (a) OPGW manufacturer should be a “Local Supplier” as per latest DPIIT and DoT notification.
- (b) (i) OPGW manufacturer must have manufactured, type tested (as per IEC or equivalent standard) and supplied at least 100 km of OPGW during last seven (7) years and the same must be in satisfactory operation^s for at least one (01) year on 66kV or above transmission line(s), as on the date of NOA.

OR

- (ii) OPGW manufacturer must have manufactured, type tested (as per IEC or equivalent standard) and supplied at least 100 km of OPGW as on the date of NOA. Further, extended warranty of one (1) year over and above the warranty period specified for OPGW shall be submitted.
- (c) OPGW manufacturer established as Subsidiary/ JVC/ Group company who has manufactured, type tested (as per IEC or equivalent standard) and supplied OPGW and meets the requirement at (a) but not (b)(i) above, shall also be considered, provided its Parent/ Principal company meets the requirement at (b)(i) above. Further the following shall also be submitted by OPGW manufacturer:
 - (i) Performance guarantee for an amount of 10% (Ten) of the cost of OPGW cable.
 - (ii) Valid collaboration agreement (between Parent/ Principal and OPGW manufacturer) for technology transfer/ license to design, manufacture, test and supply OPGW in India.

For Live Line Installation (if applicable)

Agency must have installed at least 100 km of OPGW cable in live-line condition on 66 kV or higher voltage transmission line(s), as on the date of NOA.

*Note: All relevant OPGW Forms are enclose at **Annexure-C**.*

2.4 Composite Insulators for 765kV voltage level transmission lines

2.4.1 For all insulator ratings except 320kN

2.4.1.1 The Qualified Manufacturer’s experience should include the following:

- i) **(A) QR Criteria for suppliers for 85% of cumulative quantity under packages where cumulative quantity requirement indicated in BOQ is more than 4000 nos.**

The Qualified Manufacturer should have designed, manufactured, tested and supplied minimum 2000 nos. of 160kN or above rating Composite long rod insulators for 345kV or above voltage transmission lines/ sub-stations and the same should have been in satisfactory operation⁵ for a minimum period of two years as on date of NOA.

(B) QR Criteria for suppliers for 15% of cumulative quantity under packages where cumulative quantity requirement indicated in BOQ is more than 4000 nos. and for packages where cumulative quantity requirement indicated in BOQ is less than 4000 nos.

The Qualified Manufacturer should have designed, manufactured, tested and supplied minimum 150 nos. of 160kN or above rating Composite long rod insulators for 345KV or above voltage transmission lines/ substations and the same should have been in satisfactory operation⁵ for a minimum period of two years as on date of NOA.

ii) The Qualified manufacturer should also have successfully completed at least the following tests on insulator units and insulator strings (of Composite long rod insulators) as on date of NOA.

- a. Tests on individual units of 210 KN or above rating as per IEC 61109:1995 or IEC 61109:2008.
- b. Following Type tests on insulator strings assembly for 765kV or above Voltage transmission lines with 210kN or above electromechanical strength insulators:
 - Power Frequency Voltage withstand test (Wet)
 - Switching Surge Voltage Withstand test (Wet)
 - Lightning Impulse Voltage Withstand test (Dry)
 - Radio Interference Voltage Test (Dry)
- c. Accelerated ageing test of 5000hrs as described in Appendix-C of IEC 61109 or Test at Multiple stresses of 5000 hrs as described in IEC 62730 or Annex-B of IEC 62217.

2.4.1.2 For a manufacturer, not meeting the requirements specified at 2.4.1.1(i) (A) & 2.4.1.1(ii) of its own, he should be a qualified Licensee of a qualified manufacturer meeting the above specified requirements and also meeting the conditions stipulated at 2.43.

2.4.1.3 In case the cumulative requirement of insulators indicated in the BOQ is less than 4000nos, the bidder/Contractor may supply the entire requirement from supplier(s) (with a maximum of 2000 nos. from each) meeting the Technical

requirement indicated at 2.4.1.1 (i) (B) and other mandatory requirement specified at 2.4.1.1.

2.4.1.4 In case the cumulative requirement of insulators indicated in the BOQ is more than 4000 nos., the bidder/ Contractor may supply cumulatively not more than 15% with a maximum of 2000 nos. of the requirement from a supplier meeting the Technical requirement indicated at 2.4.1.1 (i) (B) and other mandatory requirement specified at 2.4.1.1. For balance 85% quantity, the supplier shall meet the Technical requirement indicated at 2.4.1.1 (i) (A) and other mandatory requirement specified at 2.4.1.1 or Technical requirement indicated at 2.4.1.2.

2.4.2 For 320kN insulator ratings

2.4.2.1 The Qualified Manufacturer's experience should include the following:

- i) The Qualified Manufacturer should have designed, manufactured, tested and supplied minimum 2000 nos. of 160kN or above rating Composite long rod insulators for 345kV or above voltage transmission lines/ sub-stations and the same should have been in satisfactory operation⁵ for a minimum period of two years as on date of NOA.
- ii) The Qualified manufacturer should also have successfully completed at least the following tests on insulator units and insulator strings (of Composite long rod insulators) as on date of NOA.
 - a. Tests on individual units of 210 KN or above rating as per IEC 61109:1995 or IEC 61109:2008.
 - b. Following Type tests on insulator strings assembly for 765kV or above Voltage transmission lines with 210kN or above electromechanical strength insulators:
 - Power Frequency Voltage withstand test (Wet)
 - Switching Surge Voltage Withstand test (Wet)
 - Lightning Impulse Voltage Withstand test (Dry)
 - Radio Interference Voltage Test (Dry)
 - c. Accelerated ageing test of 5000hrs as described in Appendix-C of IEC 61109 or Test at Multiple stresses of 5000 hrs as described in IEC 62730 or Annex-B of IEC 62217.

2.4.2.2 For a manufacturer, not meeting the requirements specified at 2.4.2.1 of its own, he should be a qualified Licensee of a qualified manufacturer meeting the above specified requirements and also meeting the conditions stipulated at 2.43.

2.5 Composite Insulators for 400kV voltage level transmission lines with Twin Moose or Quad Moose or Twin HTLS configuration and having upto 160kN rating Insulator

2.5.1 The Qualified Manufacturer's experience should include the following:

i) (A) QR Criteria for suppliers for 85% of cumulative quantity under packages where cumulative quantity requirement indicated in BOQ is more than 4000 nos.

The Qualified Manufacturer should have designed, manufactured, tested and supplied minimum 2000 nos. of 160kN or above rating Composite long rod insulators for 345kV or above voltage transmission lines/ sub-stations and the same should have been in satisfactory operation[§] for a minimum period of two years as on date of NOA.

(B) QR Criteria for suppliers for 15% of cumulative quantity under packages where cumulative quantity requirement indicated in BOQ is more than 4000 nos. and for packages where cumulative quantity requirement indicated in BOQ is less than 4000 nos.

The Qualified Manufacturer should have designed, manufactured, tested and supplied minimum 150 nos. of 160kN or above rating Composite long rod insulators for 345KV or above voltage transmission lines/substations and the same should have been in satisfactory operation[§] for a minimum period of two years[@] as on date of NOA.

@ If the Qualified manufacturer is not meeting the stipulated two years operational experience requirements specified at 2.5.1i)(B), he shall furnish a legally enforceable undertaking for extended warranty of additional two years over and above the warranty period specified under the package.

ii) The Qualified manufacturer should also have successfully completed at least the following tests on insulator units and insulator strings (of Composite long rod insulators) as on date of NOA.

a) Tests on individual units of 160 KN or above rating as per IEC 61109:1995 or IEC 61109:2008.