SECTION-I B

GENERAL INFORMATION

TECHNICAL SPECIFICATIONS

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GENERAL INFORMATION

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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 PROPRIETORY 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

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Refer OPGW section of technical specification.

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 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.

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 operation[$] 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.

b) Following Type tests on insulator strings assembly for 345kV or above Voltage transmission lines with 160kN 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.

2.5.2 For a manufacturer, not meeting the requirements specified at 2.5.1(i) (A) & 2.5.1(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.

2.5.3 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 2.5.1 (i) (B) and other mandatory requirement specified at 2.5.1.

2.5.4 In case the cumulative requirement of insulators indicated in the BOQ is more than 4000nos, the bidder/ Contractor may supply cumulatively not more than 15% with a maximum of 2000nos of the requirement from a supplier meeting the Technical requirement indicated at 2.5.1 (i) (B) and other mandatory requirement specified at 2.5.1. For balance 85% quantity, the supplier shall meet the Technical

requirement indicated at 2.5.1 (i) (A) and other mandatory requirement specified at 2.5.1 or Technical requirement indicated at 2.5.2.

2.6 Composite Insulators for 400kV voltage level transmission lines with Triple Snowbird or Twin Lapwing or Twin HTLS configuration and having upto 210kN rating Insulator

2.6.1 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 2.6.1i) (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 210 KN or above rating as per IEC 61109-1995 or IEC 61109-2008.

b. Following Type tests on insulator strings assembly for 345kV 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.

2.6.2 For a manufacturer, not meeting the requirements specified at 2.6.1(i) (A) & 2.6.1(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.

2.6.3 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 2.6.1 (i) (B) and other mandatory requirement specified at 2.6.1.

2.6.4 In case the cumulative requirement of insulators indicated in the BOQ is more than 4000nos, the bidder/Contractor may supply cumulatively not more than 15% with a maximum of 2000nos of the requirement from a supplier meeting the Technical requirement indicated at 2.6.1 (i) (B) and other mandatory requirement specified at 2.6.1. For balance 85% quantity, the supplier shall meet the Technical requirement indicated at 2.6.1 (i) (A) and other mandatory requirement specified at 2.6.1 or Technical requirement indicated at 2.6.2.

2.7 Composite Insulators for 220kV voltage level transmission lines

2.7.1 Composite Insulators for 220kV voltage level transmission lines with Single Zebra configuration

2.7.1.1 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 120kN or above rating Composite long rod insulators for 220 kV 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 120kN or above rating Composite long rod insulators for 220 kV 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 2.7.1.1(i) (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 120 KN or above rating as per IEC 61109-1995 or IEC 61109-2008.

b. Following Type tests on insulator strings assembly for 220kV or above Voltage transmission lines with 120kN or above electromechanical strength insulators:

- Power Frequency 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.

2.7.1.2 For a manufacture, not meeting the requirements specified at 2.7.1.1(i) (A) & 2.7.1.1(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.

2.7.1.3 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 2.7.1.1 (i) (B) and other mandatory requirement specified at 2.7.1.1.

2.7.1.4 In case the cumulative requirement of insulators indicated in the BOQ is more than 4000nos, the bidder/ Contractor may supply cumulatively not more than 15% with a maximum of 2000nos of the requirement from a supplier meeting the Technical requirement indicated at 2.7.1.1 (i) (B) and other mandatory requirement specified at 2.7.1.1. For balance 85% quantity, the supplier shall meet the Technical requirement indicated at 2.7.1.1 (i) (A) and other mandatory requirement specified at 2.7.1.1 or Technical requirement indicated at 2.7.1.2.

2.7.2 Composite Insulators for 220kV voltage level transmission lines with Twin Moose configuration

2.7.2.1 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 220 kV 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 220 kV 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 2.7.2.1(i) (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.

b. Following Type tests on insulator strings assembly for 220kV or above Voltage transmission lines with 160kN or above electromechanical strength insulators:

- Power Frequency 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.

2.7.2.2 For a manufacture, not meeting the requirements specified at 2.7.2.1(i) (A) & 2.7.2.1(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.

2.7.2.3 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 2.7.2.1 (i) (B) and other mandatory requirement specified at 2.7.2.1

2.7.2.4 In case the cumulative requirement of insulators indicated in the BOQ is more than 4000nos, the bidder/ Contractor may supply cumulatively not more than 15% with a maximum of 2000nos of the requirement from a supplier meeting the Technical requirement indicated at 2.7.2.1 (i) (B) and other mandatory requirement specified at 2.7.2.1. For balance 85% quantity, the supplier shall meet the Technical requirement indicated at 2.7.2.1 (i) (A) and other mandatory requirement specified at 2.7.2.1 or Technical requirement indicated at 2.7.2.2.

2.8 Composite Insulators for 132kV voltage level transmission lines with Single Panther configuration

2.8.1 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 90kN or above rating Composite long rod insulators for 110kV 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 90kN or above rating Composite long rod insulators for 110 kV 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 2.8.1 i) (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 90 KN or above rating as per IEC 61109-1995 or IEC 61109-2008.

b. Following Type tests on insulator strings assembly for 110kV or above Voltage transmission lines with 90kN or above electromechanical strength insulators: -

- Power Frequency Voltage withstand test (Wet)
- Lightning Impulse Voltage Withstand 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.

2.8.2 For a manufacturer, not meeting the requirements specified at 2.8.1 (i) (A) & 2.8.1 (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.

2.8.3 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 2.8.1 (i) (B) and other mandatory requirement specified at 2.8.1

2.8.4 In case the cumulative requirement of insulators indicated in the BOQ is more than 4000nos, the bidder/ Contractor may supply cumulatively not more than 15% with a maximum of 2000nos of the requirement from a supplier meeting the Technical requirement indicated at 2.8.1 (i) (B) and other mandatory requirement specified at 2.8.1. For balance 85% quantity, the supplier shall meet the Technical requirement indicated at 2.8.1 (i) (A) and other mandatory requirement specified at 2.8.1 or Technical requirement indicated at 2.8.2.

2.9 Disc/ Porcelain Longrod Insulators for 400 kV voltage level transmission lines with Twin/ Quad Moose configuration

2.9.1 The Qualified manufacturer shall be a manufacturer of Insulators of similar nature for the last five years. The manufacturer's experience should include the following:

The qualified manufacturer should have designed, manufactured, tested and supplied 120 KN & 160 KN or above electro-mechanical strength of disc insulators/ long rod insulators for 110/132 KV or above voltage transmission line of quantities not less than 50,000 nos. disc insulators /6520 nos. long rod insulators of each rating and the same should have been in satisfactory operation for a minimum period of two years as on date of NOA.

Further, the manufacturer should also have successfully completed at least the following tests on insulator units and insulator strings (of # Standard &/Anti-fog disc insulators/ long rod insulators as the case may be) as on date of NOA: -

a) Tests on individual units.

b) Following type tests on insulator strings assembly for 345/ 400 KV or above voltage transmission lines with 120 KN & 160 KN or above electro-mechanical 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)

 # Either Standard or Anti-fog or both depending on scope

2.9.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.9.1 and also meeting the conditions stipulated at 2.43.

2.10 Disc/ Porcelain Longrod Insulators for 400 kV voltage level transmission lines with Triple Snowbird configuration

2.10.1 The Qualified manufacturer shall be a manufacturer of Insulators of similar nature for the last five years. The manufacturer's experience should include the following:

The qualified manufacturer should have designed, manufactured, tested and supplied 120 KN & 160 KN or above electro-mechanical strength of disc insulators/ long rod insulators for 110/132 KV or above voltage transmission line of quantities not less than 50,000 nos. disc insulators /6520 nos. long rod insulators of each rating and the same should have been in satisfactory operation for a minimum period of two years as on date of NOA.

Further, the manufacturer should also have successfully completed at least the following tests on insulator units and insulator strings (of # Standard &/Anti-fog disc insulators/ long rod insulators as the case may be) as on date of NOA: -

a) Tests on individual units.

b) Following type tests on insulator strings assembly for 345/ 400 KV or above voltage transmission lines with 120 KN & 210 KN or above electro-mechanical 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)

 # Either Standard or Anti-fog or both depending on scope

2.10.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.10.1 and also meeting the conditions stipulated at 2.43.

2.11 Disc/ Porcelain Longrod Insulators for 400 kV voltage level transmission lines with Twin Lapwing configuration

2.11.1 The Qualified manufacturer shall be a manufacturer of Insulators of similar nature for the last five years. The manufacturer's experience should include the following:

The qualified manufacturer should have designed, manufactured, tested and supplied 160 KN or above electro-mechanical strength of disc insulators/ long rod insulators for 110/132 KV or above voltage transmission line of quantities not less than 50,000 nos. disc insulators /6520 nos. long rod insulators of each rating and the same should have been in satisfactory operation for a minimum period of two years as on date of NOA.

Further, the manufacturer should also have successfully completed at least the following tests on insulator units and insulator strings (of # Standard &/Anti-fog disc insulators/ long rod insulators as the case may be) as on date of NOA: -

a) Tests on individual units.

b) Following type tests on insulator strings assembly for 345/ 400 KV or above voltage transmission lines with 160 KN & 210 KN or above electro-mechanical 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)

 # Either Standard or Anti-fog or both depending on scope

2.11.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.11.1 and also meeting the conditions stipulated at 2.43.

2.12 Disc/ Porcelain Longrod Insulators for 220 kV voltage level transmission lines with Single Zebra configuration

2.12.1 The Qualified manufacturer shall be a manufacturer of Insulators of similar nature for the last five years. The manufacturer's experience should include the following:

The qualified manufacturer should have designed, manufactured, tested and supplied 70kN & 120kN or above electro-mechanical strength of disc insulators/ long rod insulators for 110/132 KV or above voltage transmission line of quantities not less than 50,000 nos. disc insulators /6520 nos. long rod insulators of each rating and the same should have been in satisfactory operation for a minimum period of two years as on date of NOA.

Further, the manufacturer should also have successfully completed at least the following tests on insulator units and insulator strings (of # Standard &/Anti-fog disc insulators/ long rod insulators as the case may be) as on date of NOA: -

a) Tests on individual units.

b) Following type tests on insulator strings assembly for 220 KV or above voltage transmission lines with 70 KN & 120 KN or above electro-mechanical strength insulators: -

- Power frequency Voltage withstand test (Wet)
- Lightning Impulse Voltage withstand test (Dry)
- Radio interference voltage test (dry)

 # Either Standard or Anti-fog or both depending on scope

2.12.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.12.1 and also meeting the conditions stipulated at 2.43.

2.13 Disc/ Porcelain Longrod Insulators for 132kV voltage level transmission lines with Single Panther configuration

2.13.1 The Qualified manufacturer shall be a manufacturer of Insulators of similar nature for the last five years. The manufacturer's experience should include the following:

The qualified manufacturer should have designed, manufactured, tested and supplied 70kN & 90kN or above electro-mechanical strength of disc insulators/ long rod insulators for 110/132 KV or above voltage transmission line of quantities not less than 50,000 nos. disc insulators /6520 nos. long rod insulators of each rating and the same should have been in satisfactory operation for a minimum period of two years as on date of NOA.

Further, the manufacturer should also have successfully completed at least the following tests on insulator units and insulator strings (of # Standard &/Anti-fog disc insulators/ long rod insulators as the case may be) as on date of NOA: -

a) Tests on individual units.

b) Following type tests on insulator strings assembly for 110/132 KV or above voltage transmission lines with 70kN & 90kN or above electro-mechanical strength insulators: -

- Power frequency Voltage withstand test (Wet)
- Lightning Impulse Voltage withstand test (Dry)

 # Either Standard or Anti-fog or both depending on scope

2.13.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.13.1 and also meeting the conditions stipulated at 2.43.

2.14 ACSR MOOSE and ACSR ZEBRA Conductor

2.14.1 The qualified manufacturer's experience should include the following:

The qualified manufacturer should have manufactured, tested and supplied at least cumulative One Thousand (1000) km of Sixty one (61) or above strands ACSR/ AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA.

2.14.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.14.1 and also meeting the conditions stipulated at 2.43.

2.15 ACSR LAPWING Conductor

2.15.1 The qualified manufacturer's experience should include the following:

The qualified manufacturer should have manufactured, tested and supplied at least cumulative One Thousand (1000) km of Fifty two (52) or above strands ACSR/ AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA.

2.15.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.15.1 and also meeting the conditions stipulated at 2.43.

2.16 ACSR BERSIMIS Conductor

2.16.1 The qualified manufacturer's experience should include the following:

The qualified manufacturer should have manufactured, tested and supplied at least cumulative One Thousand (1000) km of Forty Nine (49) or above strands ACSR/AAAC/AL59/ AACSR conductor during last seven (7) years as on date of NOA.

2.16.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.16.1 and also meeting the conditions stipulated at 2.43.

2.17 ACSR PANTHER Conductor

2.17.1 The qualified manufacturer's experience should include the following:

The qualified manufacturer should have manufactured, tested and supplied at least cumulative One Thousand (1000) km of Thirty seven (37) or above strands ACSR/ AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA.

2.17.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.17.1 and also meeting the conditions stipulated at 2.43.

2.18 AACSR MOOSE and AACSR ZEBRA Conductor

2.18.1 The qualified manufacturer's experience should include the following:

i) The qualified manufacturer should have manufactured, tested and supplied at least cumulative One Thousand (1000) km of Sixty one (61) or above strands ACSR/ AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA and

ii) The qualified manufacturer should have manufactured, tested and supplied at least cumulative two hundred (200) km of Sixty one (61) or

above strands AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA.

2.18.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.18.1 and also meeting the conditions stipulated at 2.43.

2.19 AACSR LAPWING Conductor

2.19.1 The qualified manufacturer's experience should include the following:

i) The qualified manufacturer should have manufactured, tested and supplied at least cumulative One Thousand (1000) km of Fifty two (52) or above strands ACSR/ AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA and

ii) The qualified manufacturer should have manufactured, tested and supplied at least cumulative two hundred (200) km of Fifty two (52) or above strands AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA.

2.19.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.19.1 and also meeting the conditions stipulated at 2.43.

2.20 AACSR BERSIMIS Conductor

2.20.1 The qualified manufacturer's experience should include the following:

i) The qualified manufacturer should have manufactured, tested and supplied at least cumulative One Thousand (1000) km of Forty Nine (49) or above strands ACSR/ AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA and

ii) The qualified manufacturer should have manufactured, tested and supplied at least cumulative two hundred (200) km of Forty Nine (49) or above strands AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA.

2.20.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.20.1 and also meeting the conditions stipulated at 2.43.

2.21 AACSR PANTHER Conductor

2.21.1 The qualified manufacturer's experience should include the following:

i) The qualified manufacturer should have manufactured, tested and supplied at least cumulative One Thousand (1000) km of Thirty seven (37) or above strands ACSR/ AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA and

ii) The qualified manufacturer should have manufactured, tested and supplied at least cumulative two hundred (200) km of Thirty seven (37) or above strands AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA.

2.21.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.21.1 and also meeting the conditions stipulated at 2.43.

2.22 AAAC MOOSE, AAAC ZEBRA and AAAC BERSIMIS Conductor

2.22.1 The qualified manufacturer's experience should include the following:

i) The qualified manufacturer should have manufactured, tested and supplied at least cumulative One Thousand (1000) km of Sixty one (61) or above strands ACSR/ AAAC/ AL59/AACSR conductor during last seven (7) years as on date of NOA and

ii) The qualified manufacturer should have manufactured, tested and supplied at least cumulative two hundred (200) km of Sixty one (61) or above strands AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA.

2.22.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.22.1 and also meeting the conditions stipulated at 2.43.

2.23 AAAC PANTHER Conductor

2.23.1 The qualified manufacturer's experience should include the following:

(i) The qualified manufacturer should have manufactured, tested and supplied at least cumulative One Thousand (1000) km of Thirty Seven (37) or above strands ACSR/ AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA and

(ii) The qualified manufacturer should have manufactured, tested and supplied at least cumulative two hundred (200) km of Thirty Seven (37) or above

strands AAAC/ AL59/ AACSR conductor during last seven (7) years as on date of NOA.

2.23.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.23.1 and also meeting the conditions stipulated at 2.43.

2.24 AL59 MOOSE, AL59 ZEBRA and AL59 BERSIMIS Conductor

2.24.1 The qualified manufacturer's experience should include the following:

(a) The qualified manufacturer should have manufactured, tested and supplied at least cumulative one thousand (1000) km of ACSR/ AAAC/AL59/ AACSR conductor with Sixty one (61) strands or above during last seven (7) years as on date of NOA and

(b)(i) The qualified manufacturer should have manufactured, tested and supplied at least two hundred (200) km of AL59 conductor of thirty seven (37) strands or above during last seven (7) years as on date of NOA.

OR

(b)(ii) A manufacturer not meeting the requirements stipulated in clause (b)(i) above can also participate provided he has manufactured, tested and supplied at least cumulative two hundred (200) km of AAAC/ AL59/AACSR conductor of thirty seven (37) strands or above during last seven (7) years and should have manufactured & successfully completed following tests on AL59 Conductor of thirty seven (37) strands or above, as on date of NOA: -

i) UTS test
ii) DC resistance test

2.24.2 The proposed manufacturer can also be a qualified Licensee of a qualified manufacturer meeting the above specified requirements at 2.24.1 (a) & 2.24.1(b) (i) above and also meeting the conditions stipulated at 2.43.

2.25 AL59 PANTHER Conductor

2.25.1 The qualified manufacturer's experience should include the following:

(a) The qualified manufacturer should have manufactured, tested and supplied at least cumulative one thousand (1000) km of ACSR/ AAAC/ AL59/ AACSR conductor with thirty seven (37) strands or above during last seven (7) years as on date of NOA and

(b)(i) The qualified manufacturer should have manufactured, tested and supplied at least two hundred (200) km of AL59 conductor of thirty seven (37) strands or above during last seven (7) years as on date of NOA.

OR

(b)(ii) A manufacturer not meeting the requirements stipulated in clause (b)(i) above can also participate provided he has manufactured, tested and supplied at least cumulative two hundred (200) km of AAAC/ AL59/ AACSR conductor of thirty seven (37) strands or above during last seven (7) years and should have manufactured & successfully completed following tests on AL59 Conductor of thirty seven (37) strands or above, as on date of NOA: -

i) UTS test
ii) DC resistance test

2.25.2 The proposed manufacturer can also be a qualified Licensee of a qualified manufacturer meeting the above specified requirements at 2.25.1 (a) & 2.25.1(b) (i) above and also meeting the conditions stipulated at 2.43.

2.26 HTLS Conductor for 400 kV voltage level transmission lines

2.26.1 (a) The Qualified Manufacturer should have manufactured, tested and supplied at least one hundred (100) km of High temperature low sag (HTLS) conductor## of same technology as that of the conductor being offered in this package having minimum thirty seven (37) number of strands or 200 sq. mm. aluminium cross section area in last seven (7) years as on date of NOA and the same should have been in satisfactory operation[$] for a period of at least one (1) year as on date of NOA.

OR

(b) The Qualified Manufacturer should have manufactured, tested and supplied at least one hundred (100) km of High temperature low sag (HTLS) conductor## of same technology as that of the conductor being offered in this package having minimum thirty seven (37) number of strands or 200 sq. mm. aluminium cross section area in last seven (7) years as on date of NOA and the same should have been in satisfactory operation[$] as on date of NOA.

OR

(c) i) The Qualified Manufacturer should have manufactured, tested and supplied at least one hundred (100) km of High temperature low sag (HTLS) conductor## having minimum thirty-seven (37) number of strands or 200 sq. mm. aluminium

cross section area in last Seven (7) years as on date of NOA and the same should have been in satisfactory operation$ as on date of NOA.

And

ii) The Qualified Manufacturer should have successfully carried out following tests on the HTLS conductor## of same technology as that of the conductor being offered in this package as on date of NOA: -

A) **<u>On complete Conductor</u>**

i) DC resistance test on stranded conductor

ii) UTS test on stranded conductor at ambient & at designed elevated temperature (minimum 150 deg C design temperature)

<u>B) On Conductor Strand</u>

i) Heat resistance test on Aluminium Alloy strands (not applicable for annealed aluminium)

ii) Breaking load test on Aluminium#/ Aluminium Alloy# strands

iii) Conductivity test on Aluminium#/ Aluminium Alloy# strands

<u>C) On core strands/Composite core, as applicable.</u>

i) Torsion and Elongation tests on core strands#/composite core#

ii) Breaking load test on core strands#/ Composite core#

iii) Glass transition temperature test (For composite core only)

iv) Flexural Strength test (For composite core only)

as the case may be

OR

(d) The manufacturer not meeting the qualification requirements stipulated in clause 2.26.1(a) or 2.26.1(b) or 2.26.1 (c) above can also participate as a Licensee of a Licensor meeting the requirement stipulated at Clause 2.26.1(a) and also meeting the conditions stipulated at Clause 2.44 provided that: -

i) The manufacturer/ Licensee has manufactured, tested and supplied at least cumulative one thousand (1000) km of ACSR/ AAAC/ ACAR/ AACSR/ AL59 conductor having at least same or more number of strands as that of the conductor being offered in this package during last seven (7) years as on the date of NOA and

ii) The manufacturer/ Licensee should have established manufacturing facility & developed High temperature low sag (HTLS) conductor of same technology as that of the conductor being offered in this package having minimum thirty-seven (37) number of strands or 200 sq. mm aluminium cross section area and should have

successfully carried out following tests on HTLS conductor## of same Technology as that of the conductor being offered in this package as on date of NOA: -

A) **<u>On complete Conductor</u>**

i) DC resistance test on stranded conductor

ii) UTS test on stranded conductor at ambient & at designed elevated temperature (minimum 150 deg C design temperature)

<u>B) On Conductor Strand</u>

i) Heat resistance test on Aluminium Alloy strands (not applicable for annealed aluminium)

ii) Breaking load test on Aluminium#/ Aluminium Alloy# strands

iii) Conductivity test on Aluminium#/ Aluminium Alloy# strands

<u>C) On core strands/Composite core, as applicable.</u>

i) Torsion and Elongation tests on core strands#/composite core#

ii) Breaking load test on core strands#/ Composite core#

iii) Glass transition temperature test (For composite core only)

iv) Flexural Strength test (For composite core only)

as the case may be

Note:

1. In case of Clause 2.26.1 (b) & 2.26.1 (c) above, the warranty obligations in terms of 10% of the ex-work cost of the HTLS conductor for additional period of two (2) years over and above the warranty period as specified in the bidding documents shall be applicable.
2. In case of Clause 2.26.1 (d) above, the manufacturer participating as a Licensee shall provide warranty obligations in terms of 10% of the ex-work cost of the HTLS conductor for additional period of two (2) years over and above the warranty period specified in the bidding documents.
3. ## Regarding HTLS conductor covered under clause 2.26.1(a), 2.26.1(b), 2.26.1(c) and 2.26.1(d): -

   HTLS conductor means either of the following technology type:

   (i) (Z)TACIR / STACIR: (Conductor with INVAR core)

   (ii) G(Z)TACSR (GAP Conductor)

   (iii) Steel/ coated steel/ steel alloy core with an envelope of annealed aluminium

   (iv) Metal-Matrix Composite (MMC) core with an envelope of thermal-resistant aluminium alloys

   (v) Polymer-matrix composite (PMC) core (solid and/or stranded type) with an envelope of annealed aluminium/ thermal-resistant aluminium alloy (Carbon Composite Core (CCC) Conductor)

4. The tests indicated at 2.26.1 c) ii) B), 2.26.1 c) ii) C), 2.26.1 d) ii) B) & 2.26.1 d) ii) C) above should have been carried out by the manufacturer/ Licensee on their own or by their supplier of aluminium alloy strands, core/ core strands.

2.27 HTLS Conductor for 220 kV voltage level transmission lines

2.27.1 (a) The Qualified Manufacturer should have manufactured, tested and supplied at least one hundred (100) km of High temperature low sag (HTLS) conductor## of same technology as that of the conductor being offered in this package having minimum thirty three (33) number of strands or 150 sq. mm. aluminium cross section area in last seven (7) years as on date of NOA and the same should have been in satisfactory operation$ for a period of at least one (1) year as on date of NOA.

OR

(b) The Qualified Manufacturer should have manufactured, tested and supplied at least one hundred (100) km of High temperature low sag (HTLS) conductor## of same technology as that of the conductor being offered in this package having minimum thirty three (33) number of strands or 150 sq. mm. aluminium cross section area in last seven (7) years as on date of NOA and the same should have been in satisfactory operation$ as on date of NOA.

OR

(c) i) The Qualified Manufacturer should have manufactured, tested and supplied at least one hundred (100) km of High temperature low sag (HTLS) conductor## having minimum thirty-three (33) number of strands or 150 sq. mm. aluminium cross section area in last Seven (7) years as on date of NOA and the same should have been in satisfactory operation$ as on date of NOA.

And

ii) The Qualified Manufacturer should have successfully carried out following tests on the HTLS conductor## of same technology as that of the conductor being offered in this package as on date of NOA: -

A) **<u>On complete Conductor</u>**

i) DC resistance test on stranded conductor

ii) UTS test on stranded conductor at ambient & at designed elevated temperature (minimum 150 deg C design temperature)

<u>B) On Conductor Strand</u>

i) Heat resistance test on Aluminium Alloy strands (not applicable for annealed aluminium)

ii) Breaking load test on Aluminium#/ Aluminium Alloy# strands

iii) Conductivity test on Aluminium#/ Aluminium Alloy# strands

C) On core strands/Composite core, as applicable.

i) Torsion and Elongation tests on core strands#/composite core#
ii) Breaking load test on core strands#/ Composite core#
iii) Glass transition temperature test (For composite core only)
iv) Flexural Strength test (For composite core only)

as the case may be

OR

(d) The manufacturer not meeting the qualification requirements stipulated in clause 2.27.1(a) or 2.27.1(b) or 2.27.1(c) above can also participate as a Licensee of a Licensor meeting the requirement stipulated at Clause 2.27.1 (a) and also meeting the conditions stipulated at Clause 2.44 provided that: -

i) The manufacturer/ Licensee has manufactured, tested and supplied at least cumulative one thousand (1000) km of ACSR/ AAAC/ ACAR/ AACSR/ AL59 conductor having at least same or more number of strands as that of the conductor being offered in this package during last seven (7) years as on the date of NOA and

ii) The manufacturer/ Licensee should have established manufacturing facility & developed High temperature low sag (HTLS) conductor of same technology as that of the conductor being offered in this package having minimum thirty three (33) number of strands or 150 sq. mm aluminium cross section area and should have successfully carried out following tests on HTLS conductor## of same Technology as that of the conductor being offered in this package as on date of NOA: -

A) **On complete Conductor**

i) DC resistance test on stranded conductor
ii) UTS test on stranded conductor at ambient & at designed elevated temperature (minimum 150 deg C design temperature)

B) On Conductor Strand

i) Heat resistance test on Aluminium Alloy strands (not applicable for annealed aluminium)
ii) Breaking load test on Aluminium#/ Aluminium Alloy# strands
iii) Conductivity test on Aluminium#/ Aluminium Alloy# strands

C) On core strands/Composite core, as applicable.

i) Torsion and Elongation tests on core strands#/composite core#
ii) Breaking load test on core strands#/ Composite core#
iii) Glass transition temperature test (For composite core only)
iv) Flexural Strength test (For composite core only)

as the case may be

Note:

1. In case of Clause 2.27.1 (b) & 2.27.1 (c) above, the warranty obligations in terms of 10% of the ex-work cost of the HTLS conductor for additional period of two (2) years over and above the warranty period as specified in the bidding documents shall be applicable.
2. In case of Clause 2.27.1 (d) above, the manufacturer participating as a Licensee shall provide warranty obligations in terms of 10% of the ex-work cost of the HTLS conductor for additional period of two (2) years over and above the warranty period specified in the bidding documents.
3. ## Regarding HTLS conductor covered under clause 2.27.1(a), 2.27.1(b), 2.27.1(c) and 2.27.1(d): -
   HTLS conductor means either of the following technology type:
   (i) (Z)TACIR / STACIR: (Conductor with INVAR core)
   (ii) G(Z)TACSR (GAP Conductor)
   (iii) Steel/ coated steel/ steel alloy core with an envelope of annealed aluminium
   (iv) Metal-Matrix Composite (MMC) core with an envelope of thermal-resistant aluminium alloys
   (v) Polymer-matrix composite (PMC) core (solid and/or stranded type) with an envelope of annealed aluminium/ thermal-resistant aluminium alloy (Carbon Composite Core (CCC) Conductor)
4. The tests indicated at 2.27.1 c) ii) B), 2.27.1 c) ii) C), 2.27.1 d) ii) B) & 2.27.1 d) ii) C) above should have been carried out by the manufacturer/ Licensee on their own or by their supplier of aluminium alloy strands, core/ core strands.

2.28 HTLS Conductor for 132 kV voltage level transmission lines

2.28.1 (a) The Qualified Manufacturer should have manufactured, tested and supplied at least one hundred (100) km of High temperature low sag (HTLS) conductor## of same technology as that of the conductor being offered in this package having minimum thirty (30) number of strands or 100 sq. mm. aluminium cross section area in last seven (7) years as on date of NOA and the same should have been in satisfactory operation[$] for a period of at least one (1) year as on date of NOA.

OR

(b) The Qualified Manufacturer should have manufactured, tested and supplied at least one hundred (100) km of High temperature low sag (HTLS) conductor## of same technology as that of the conductor being offered in this package having minimum thirty (30) number of strands or 100 sq. mm. aluminium cross section area in last seven (7) years as on date of NOA and the same should have been in satisfactory operation$ as on date of NOA.

OR

(c) i) The Qualified Manufacturer should have manufactured, tested and supplied at least one hundred (100) km of High temperature low sag (HTLS) conductor## having minimum thirty-three (33) number of strands or 150 sq. mm. aluminium cross section area in last Seven (7) years as on date of NOA and the same should have been in satisfactory operation$ as on date of NOA.

And

ii) The Qualified Manufacturer should have successfully carried out following tests on the HTLS conductor## of same technology as that of the conductor being offered in this package as on date of NOA: -

A) **<u>On complete Conductor</u>**

i) DC resistance test on stranded conductor
ii) UTS test on stranded conductor at ambient & at designed elevated temperature (minimum 150 deg C design temperature)

<u>B) On Conductor Strand</u>

i) Heat resistance test on Aluminium Alloy strands (not applicable for annealed aluminium)
ii) Breaking load test on Aluminium#/ Aluminium Alloy# strands
iii) Conductivity test on Aluminium#/ Aluminium Alloy# strands

<u>C) On core strands/Composite core, as applicable.</u>

i) Torsion and Elongation tests on core strands#/composite core#
ii) Breaking load test on core strands#/ Composite core#
iii) Glass transition temperature test (For composite core only)
iv) Flexural Strength test (For composite core only)

as the case may be

(d) The manufacturer not meeting the qualification requirements stipulated in clause 2.27.1(a) or 2.27.1(b) or 2.27.1(c) above can also participate as a Licensee of a Licensor meeting the requirement stipulated at Clause 2.27.1(a) and also meeting the conditions stipulated at Clause 2.44 provided that: -

i) The manufacturer/ Licensee has manufactured, tested and supplied at least cumulative one thousand (1000) km of ACSR/ AAAC/ ACAR/ AACSR/ Al59 conductor having at least same or more number of strands as that of the conductor being offered in this package during last seven (7) years as on the date of NOA and

ii) The manufacturer/ Licensee should have established manufacturing facility & developed High temperature low sag (HTLS) conductor of same technology as that of the conductor being offered in this package having minimum thirty (30) number of strands or 100 sq. mm aluminium cross section area and should have successfully carried out following tests on HTLS conductor## of same Technology as that of the conductor being offered in this package as on date of NOA:-

A) **<u>On complete Conductor</u>**

i) DC resistance test on stranded conductor
ii) UTS test on stranded conductor at ambient & at designed elevated temperature (minimum 150 deg C design temperature)

<u>B) On Conductor Strand</u>

i) Heat resistance test on Aluminium Alloy strands (not applicable for annealed aluminium)
ii) Breaking load test on Aluminium#/ Aluminium Alloy# strands
iii) Conductivity test on Aluminium#/ Aluminium Alloy# strands

<u>C) On core strands/Composite core, as applicable.</u>

i) Torsion and Elongation tests on core strands#/composite core#
ii) Breaking load test on core strands#/ Composite core#
iii) Glass transition temperature test (For composite core only)
iv) Flexural Strength test (For composite core only)

as the case may be

Note:

1. In case of Clause 2.27.1 (b) & 2.27.1 (c) above, the warranty obligations in terms of 10% of the ex-work cost of the HTLS conductor for additional period of two (2) years over and above the warranty period as specified in the bidding documents shall be applicable.
2. In case of Clause 2.27.1 (d) above, the manufacturer participating as a Licensee shall provide warranty obligations in terms of 10% of the ex-work cost of the HTLS conductor for additional period of two (2) years over and above the warranty period specified in the bidding documents.

3. ## Regarding HTLS conductor covered under clause 2.27.1(a), 2.27.1(b), 2.27.1(c) and 2.27.1(d): -
   HTLS conductor means either of the following technology type:
   (i) (Z)TACIR / STACIR: (Conductor with INVAR core)
   (ii) G(Z)TACSR (GAP Conductor)
   (iii) Steel/ coated steel/ steel alloy core with an envelope of annealed aluminium
   (iv) Metal-Matrix Composite (MMC) core with an envelope of thermal-resistant aluminium alloys
   (v) Polymer-matrix composite (PMC) core (solid and/or stranded type) with an envelope of annealed aluminium/ thermal-resistant aluminium alloy (Carbon Composite Core (CCC) Conductor)
4. The tests indicated at 2.28.1 c) ii) B), 2.28.1 c) ii) C), 2.28.1 d) ii) B) & 2.28.1 d) ii) C) above should have been carried out by the manufacturer/ Licensee on their own or by their supplier of aluminium alloy strands, core/ core strands.

2.29 Technical Qualification Requirement for supplier of core of any special material for High temperature low sag conductor (HTLS)

The Conductor manufacturer shall use core of any special material (if used) such as Invar steel or composite core supplied from the qualified manufacture(s) meeting the following requirements: -

The Qualified Manufacturer should have manufactured, tested and supplied at least two hundred (200) km of the same type of core material as used in the HTLS conductor being offered in the package. Further, conductor manufactured from the supplied core of such manufacturers should have been in satisfactory operation[$] for a period of at least two years as on date of NOA.

An undertaking by the proposed supplier of core of HTLS conductor shall be submitted during execution of the contract (Performa enclosed as ***Annexure–D*** to this section).

2.30 Clamp fittings and accessories for high temperature low sag conductor (HTLS) for 400 kV voltage level transmission lines

2.30.1 (a) The qualified manufacturer(s) should have designed, manufactured, tested and supplied fittings for suspension & tension strings and accessories for any type of conductor, viz. ACSR, AACSR, AAAC etc. for 345/400 kV or above voltage transmission line.

Further, the qualified manufacturer(s) for any individual item(s) of clamp fittings and accessories covered under the package should have designed, manufactured, tested and supplied the item(s) of clamp fittings and accessories for High temperature low sag (HTLS) conductor of same technology as that of the conductor being offered in the package(s) for application on 66 kV or above voltage transmission line and the same should have been in satisfactory operation[$] for a minimum period of two (2) years as on date of NOA.

The manufacturer(s) meeting the above requirement for any individual item or items shall be considered qualified for the respective item or items only.

b) However, if the proposed manufacturer of Hardware fittings and Accessories for conductor is not meeting the above requirements on its own, he should be qualified licensee of a qualified manufacturer meeting the above specified requirements and meeting the conditions stipulated at 2.43.

2.30.2 For Indigenous Manufacturer

The Indigenous manufacturer^ of hardware fittings and accessories not meeting the requirement of clause 2.30.1(a) above can also supply provided they meet the following requirements: -

The indigenous manufacturer^ must have designed, manufactured, tested and supplied fittings for suspension & tension strings and accessories for any type of conductor, viz. ACSR, AACSR, AAAC etc. for 345/400 kV or above voltage transmission line as on date of NOA.

Further, the indigenous manufacturer^ for any individual item(s) of clamp fittings and accessories covered under the package should have designed, manufactured and type tested, as per the Technical specification of POWERGRID, the item(s) of clamp fittings and accessories for same technology of HTLS conductor as being offered in the package for application of 345/400 kV or above voltage transmission line as on date of NOA.

The Contractor shall furnish a legally enforceable undertaking for extended warranty^^ of additional two (2) years over and above the warrantee period specified under the package.

^ Indigenous manufacturer means a manufacturer who proposes to offer the fittings and accessories for HTLS conductor from manufacturing facilities located in India.

^^ Additional extended warranty in terms of 10 % CPG corresponding to cost of the item(s).

2.31 Clamp fittings and accessories for high temperature low sag conductor (HTLS) for 220kV voltage level transmission line

2.31.1 a) The qualified manufacturer(s) should have designed, manufactured, tested and supplied fittings for suspension & tension strings and accessories for any type of conductor, viz. ACSR, AACSR, AAAC etc. for 220 kV or above voltage transmission line. Further, the qualified manufacturer(s) for any individual item(s) of clamp fittings and accessories covered under the package should have designed, manufactured, tested and supplied the item(s) of clamp fittings and accessories for High temperature low sag (HTLS) conductor of same technology as that of the conductor being offered in the package(s) for application on 66 kV or above voltage transmission line and the same should have been in satisfactory operation$ for a minimum period of two (2) years as on date of NOA.

The manufacturer(s) meeting the above requirement for any individual item or items shall be considered qualified for the respective item or items only.

b) However, if the proposed manufacturer of Hardware fittings and Accessories for conductor is not meeting the above requirements on its own, he should be qualified licensee of a qualified manufacturer meeting the above specified requirements and meeting the conditions stipulated at 2.43.

2.31.2 For Indigenous Manufacturer

a) The Indigenous manufacturer^ of hardware fittings and accessories not meeting the requirement of clause 2.31.1(a) above can also supply provided they meet the following requirements: -

The indigenous manufacturer^ must have designed, manufactured, tested and supplied fittings for suspension & tension strings and accessories for any type of conductor, viz. ACSR, AACSR, AAAC etc. for 220 kV or above voltage transmission line as on date of NOA.

Further, the indigenous manufacturer^ for any individual item(s) of clamp fittings and accessories covered under the package should have designed, manufactured and type tested, as per the Technical specification of POWERGRID, the item(s) of clamp fittings and accessories for same technology of HTLS conductor as being offered in the package for application of 220 kV or above voltage transmission line as on date of NOA.

The Contractor shall furnish a legally enforceable undertaking for extended warranty^^ of additional two (2) years over and above the warrantee period specified under the package.

^ Indigenous manufacturer means a manufacturer who proposes to offer the fittings and accessories for HTLS conductor from manufacturing facilities located in India.

^^ Additional extended warranty in terms of 10% CPG corresponding to cost of the item(s).

2.32 Clamp fittings and accessories for high temperature low sag conductor (HTLS) for 132kV voltage level transmission lines

2.32.1 The qualified manufacturer(s) should have designed, manufactured, tested and supplied fittings for suspension & tension strings and accessories for any type of conductor, viz. ACSR, AACSR, AAAC etc. for 110/ 132 kV or above voltage transmission line.

Further, the qualified manufacturer(s) for any individual item(s) of clamp fittings and accessories covered under the package should have designed, manufactured, tested and supplied the item(s) of clamp fittings and accessories for High temperature low sag (HTLS) conductor of same technology as that of the conductor being offered in the package(s) for application on 66 kV or above voltage transmission line and the same should have been in satisfactory operation$ for a minimum period of two (2) years as on date of NOA.

The manufacturer(s) meeting the above requirement for any individual item or items shall be considered qualified for the respective item or items only.

b) However, if the proposed manufacturer of Hardware fittings and Accessories for conductor is not meeting the above requirements on its own, he should be qualified licensee of a qualified manufacturer meeting the above specified requirements and meeting the conditions stipulated at 2.43.

2.32.2 For Indigenous Manufacturer

The Indigenous manufacturer^ of hardware fittings and accessories not meeting the requirement of clause 2.32.1(a) above can also supply provided they meet the following requirements: -

The indigenous manufacturer^ must have designed, manufactured, tested and supplied fittings for suspension & tension strings and accessories for any type of conductor, viz. ACSR, AACSR, AAAC etc. for 110/132 kV or above voltage transmission line as on date of NOA.

Further, the indigenous manufacturer^ for any individual item(s) of clamp fittings and accessories covered under the package should have designed, manufactured and type tested, as per the Technical specification of POWERGRID, the item(s) of clamp fittings and accessories for same technology of HTLS conductor as being offer in the package for application of 110/ 132 kV or above voltage transmission line as on date of NOA.

The Contractor shall furnish a legally enforceable undertaking for extended warranty^^ of additional two (2) years over and above the warrantee period specified under the package.

^ Indigenous manufacturer means a manufacturer who proposes to offer the fittings and accessories for HTLS conductor from manufacturing facilities located in India.

^^ Additional extended warranty in terms of 10% CPG corresponding to cost of the item(s).

2.33 Hardware Fittings for 765kV voltage level transmission lines

2.33.1 The qualified manufacturer shall be a manufacturer of hardware fittings of similar nature. The qualified manufacturer's experience should include the following:

(i) The qualified manufacturer should have designed, manufactured, tested and supplied hardware fittings for at least 600 sets of tension strings and 1200 sets of suspension strings for 765kV or above voltage transmission line and the same should have been in satisfactory operation[$] for a minimum period of two (2) years as on date of NOA;

OR

(ii) (a) Alternatively, the qualified manufacturer should have designed, manufactured, tested and supplied hardware fittings for at least 600 sets of tension strings and 1200 sets of suspension strings for 345kV or above voltage transmission line and the same should have been in satisfactory operation for a minimum period of two (2) years as on as on date of NOA; and

(b) The qualified manufacturer should also have successfully completed at least the following type tests on tension & suspension strings for 765kV or above application as on date of NOA: -

- Power Frequency Voltage withstand test (Wet)
- Switching Surge Voltage Withstand test (Wet)
- Lightning Impulse Voltage Withstand test (Dry)
- Corona & Radio Interference Voltage Test (Dry)

(iii) In case of indigenous manufacturers, if the Qualified manufacturer is not meeting the stipulated two years operational experience requirements specified at (i) & (ii) (a) above, the contractor shall furnish extended warranty^^ of additional two years over and above the warranty period specified under the package.

^^ Additional extended warranty in terms of 10% CPG corresponding to cost of the item(s).

2.33.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.33.1 (i) or (ii) and also meeting the conditions stipulated at 2.43.

2.34 Hardware Fittings for 400 kV voltage level transmission line

2.34.1 The qualified manufacturer shall be a manufacturer of hardware fittings of similar nature. The qualified manufacturer's experience should include the following:

(i) The qualified manufacturer should have designed, manufactured, tested and supplied hardware fittings for at least 600 sets of tension strings and 1200 sets of suspension strings for 345kV or above voltage transmission line and the same should have been in satisfactory operation$ for a minimum period of two (2) years as on date of NOA: -

OR

(ii) (a) Alternatively, the qualified manufacturer should have designed, manufactured, tested and supplied hardware fittings for at least 600 sets of tension strings and 1200 sets of suspension strings for 220kV or above voltage

transmission line and the same should have been in satisfactory operation for a minimum period of two (2) years as on as on date of NOA; and

(b) The qualified manufacturer should also have successfully completed at least the following type tests on tension & suspension strings for 345kV or above application as on date of NOA:

- Power Frequency Voltage withstand test (Wet)
- Switching Surge Voltage Withstand test (Wet)
- Lightning Impulse Voltage Withstand test (Dry)
- Corona & Radio Interference Voltage Test (Dry)

(iii) In case of indigenous manufacturers, if the Qualified manufacturer is not meeting the stipulated two years operational experience requirements specified at (i) & (ii) (a) above, the contractor shall furnish extended warranty^^ of additional two years over and above the warranty period specified under the package.

^^ Additional extended warranty in terms of 10% CPG corresponding to cost of the item(s).

2.34.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.34.1 (i) or (ii) and also meeting the conditions stipulated at 2.43.

2.35 Hardware Fittings for 220 kV voltage level transmission line

2.35.1 The qualified manufacturer shall be a manufacturer of hardware fittings of similar nature. The qualified manufacturer's experience should include the following:

(i) The qualified manufacturer should have designed, manufactured, tested and supplied hardware fittings for at least 600 sets of tension strings and 1200 sets of suspension strings for 220kV or above voltage transmission line and the same should have been in satisfactory operation$ for a minimum period of two (2) years as on date of NOA;

OR

(ii) (a) Alternatively, the qualified manufacturer should have designed, manufactured, tested and supplied hardware fittings for at least 600 sets of tension strings and 1200 sets of suspension strings for 110kV or above voltage transmission line and the same should have been in satisfactory operation for a minimum period of two (2) years as on as on date of NOA; and

(b) The qualified manufacturer should also have successfully completed at least the following type tests on tension & suspension strings for 220kV or above application as on date of NOA:

- Power Frequency Voltage withstand test (Wet)
- Lightning Impulse Voltage Withstand test (Dry)

(iii) In case of indigenous manufacturers, if the Qualified manufacturer is not meeting the stipulated two years operational experience requirements specified at (i) & (ii) (a) above, the contractor shall furnish extended warranty^^ of additional two years over and above the warranty period specified under the package.

^^ Additional extended warranty in terms of 10% CPG corresponding to cost of the item(s).

2.35.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.35.1 (i) or (ii) and also meeting the conditions stipulated at 2.43.

2.36 Hardware Fittings for 132 kV voltage level transmission line

2.36.1 The qualified manufacturer shall be a manufacturer of hardware fittings of similar nature. The qualified manufacturer's experience should include the following:

(i) The qualified manufacturer should have designed, manufactured, tested and supplied hardware fittings for at least 600 sets of tension strings and 1200 sets of suspension strings for 110kV or above voltage transmission line and the same should have been in satisfactory operation$ for a minimum period of two (2) years as on date of NOA;

(ii) In case of indigenous manufacturers, if the Qualified manufacturer is not meeting the stipulated two years operational experience requirements specified at (i) above, the contractor shall furnish extended warranty^^ of additional two years over and above the warranty period specified under the package.

^^ Additional extended warranty in terms of 10 % CPG corresponding to cost of the item(s).

2.36.2 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.36.1 (i) and also meeting the conditions stipulated at 2.43.

2.37 Accessories for Conductor and Earth wire for 765kV voltage level transmission line

2.37.1 The qualified manufacturer shall be a manufacturer of accessories for conductor & earthwire of similar nature. The qualified manufacturer experience should include the following:

The qualified manufacturer should have designed, manufactured, tested and supplied the item(s) of accessories for conductor & earth wire covered under the package or item(s) of similar/ comparable nature. For spacer dampers for Hexa/ Quad bundle conductor and vibration dampers for earth wire, the experience should include at least the supply of 6900 nos. of quad spacer dampers and 2300 nos. of vibration dampers for earth wire for 345kV or above transmission line and the same should have been in satisfactory operation[$] for a minimum period of two (2) years as on date of NOA. (For accessories for galvanized steel Earthwire, the requirement of voltage level shall not be applicable).

2.37.2 In case of indigenous manufacturers, if the Qualified manufacturer is not meeting the stipulated two years operational experience requirements specified at 2.37.1 above, the contractor shall furnish extended warranty^^ of additional two years over and above the warranty period specified under the package.

^^ Additional extended warranty in terms of 10 % CPG corresponding to cost of the item(s).

2.37.3 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.37.1 and also meeting the conditions stipulated at 2.43.

2.37.4 The manufacturer(s) meeting the above requirement for any individual item or items shall be considered qualified for the respective item or items only.

2.38 Accessories for Conductor and Earth wire for 400 kV transmission line with Quad/ Triple bundle conductor

2.38.1 The qualified manufacturer shall be a manufacturer of accessories for conductor & earthwire of similar nature. The qualified manufacturer experience should include the following:

The qualified manufacturer should have designed, manufactured, tested and supplied the item(s) of accessories for conductor & earth wire covered under the package or item(s) of similar/ comparable nature. For spacer dampers for Quad/ Triple bundle conductor and vibration dampers for earth wire, the experience should include at least the supply of 6900 nos. of quad spacer dampers and 1950 nos. of vibration dampers for earth wire for 345kV or above transmission line and

the same should have been in satisfactory operation[$] for a minimum period of two (2) years as on date of NOA. (For accessories for galvanized steel Earthwire, the requirement of voltage level shall not be applicable).

2.38.2 In case of indigenous manufacturers, if the Qualified manufacturer is not meeting the stipulated two years operational experience requirements specified at 2.38.1 above, the contractor shall furnish extended warranty^^ of additional two years over and above the warranty period specified under the package.

^^ Additional extended warranty in terms of 10% CPG corresponding to cost of the item(s).

2.38.3 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.38.1 and also meeting the conditions stipulated at 2.43.

2.38.4 The manufacturer(s) meeting the above requirement for any individual item or items shall be considered qualified for the respective item or items only.

2.39 Accessories for Conductor and Earth wire for 400 kV transmission line with twin bundle conductor

2.39.1 The qualified manufacturer shall be a manufacturer of accessories for conductor & earthwire of similar nature. The qualified manufacturer experience should include the following:

The qualified manufacturer should have designed, manufactured, tested and supplied the item(s) of accessories for conductor & earth wire covered under the package or item(s) of similar/ comparable nature. For Bundle Spacer and Vibration dampers, the experience should include at least the supply of 7,875 nos. of twin bundle spacers and 5,850 nos. of vibration dampers for conductor and 1,950 nos. of vibration dampers for earthwire for 220kV or above voltage transmission line and the same should have been in satisfactory operation[$] for a minimum period of two (2) years as on date of NOA. (For accessories for galvanized steel Earthwire, the requirement of voltage level shall not be applicable).

2.39.2 In case of indigenous manufacturers, if the Qualified manufacturer is not meeting the stipulated two years operational experience requirements specified at 2.39.1 above, the contractor shall furnish extended warranty^^ of additional two years over and above the warranty period specified under the package.

^^ Additional extended warranty in terms of 10 % CPG corresponding to cost of the item(s).

2.39.3 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.39.1 and also meeting the conditions stipulated at 2.43.

2.39.4 The manufacturer(s) meeting the above requirement for any individual item or items shall be considered qualified for the respective item or items only.

2.40 Accessories for Conductor and Earth wire for 220kV transmission line

2.40.1 The qualified manufacturer shall be a manufacturer of accessories for conductor & earthwire of similar nature. The qualified manufacturer experience should include the following:

The qualified manufacturer should have designed, manufactured, tested and supplied the item(s) of accessories for conductor & earth wire covered under the package or item(s) of similar/comparable nature. For Bundle Spacer and Vibration dampers, the experience should include at least the supply of 7,875 nos. of twin bundle spacers and 5,850 nos. of vibration dampers for conductor and 1,950 nos. of vibration dampers for earthwire for 220kV or above voltage transmission line and the same should have been in satisfactory operation$ for a minimum period of two (2) years as on date of NOA. (For accessories for galvanized steel Earthwire, the requirement of voltage level shall not be applicable).

2.40.2 In case of indigenous manufacturers, if the Qualified manufacturer is not meeting the stipulated two years operational experience requirements specified at 2.40.1 above, the contractor shall furnish extended warranty^^ of additional two years over and above the warranty period specified under the package.

^^ Additional extended warranty in terms of 10 % CPG corresponding to cost of the item(s).

2.40.3 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.40.1 and also meeting the conditions stipulated at 2.43.

2.40.4 The manufacturer(s) meeting the above requirement for any individual item or items shall be considered qualified for the respective item or items only.

2.41 Accessories for Conductor and Earth wire for 132 kV transmission line

2.41.1 The qualified manufacturer shall be a manufacturer of accessories for conductor & earthwire of similar nature. The qualified manufacturer experience should include the following:

The qualified manufacturer should have designed, manufactured, tested and supplied the item(s) of accessories for conductor & earth wire covered under the package or item(s) of similar/ comparable nature. For Vibration dampers, the experience should include at least the supply of 5,850 nos. of vibration dampers for conductor and 1,950 nos. of vibration dampers for earthwire for 132kV or

above voltage transmission line and the same should have been in satisfactory operation[$] for a minimum period of two (2) years as on date of NOA. (For accessories for galvanized steel Earthwire, the requirement of voltage level shall not be applicable).

2.41.2 In case of indigenous manufacturers, if the Qualified manufacturer is not meeting the stipulated two years operational experience requirements specified at 2.41.1 above, the contractor shall furnish extended warranty^^ of additional two years over and above the warranty period specified under the package.

^^ Additional extended warranty in terms of 10 % CPG corresponding to cost of the item(s).

2.41.3 The proposed manufacturer can also be a qualified licensee of a qualified manufacturer meeting the above specified requirements at 2.41.1 and also meeting the conditions stipulated at 2.43.

2.41.4 The manufacturer(s) meeting the above requirement for any individual item or items shall be considered qualified for the respective item or items only.

2.42 Mono Pole Structures

(*Applicable in packages *where QR provisions for Pole structure manufacturers is not covered under Main QR)

The bidder/ Contractor should have its own manufacturing facilities & experience as stipulated below or should have assured access to supply the pole structures from Qualified Manufacturer(s) meeting individually the following minimum requirements and must demonstrate that based on known commitments they will be available for use in the proposed contract: -

The qualified manufacturer should have its own manufacturing facilities for transmission line pole structures. Further, the qualified manufacturer should have designed, manufactured and either type tested or supplied transmission line pole structures for *345kV or above voltage /**220 kV or above voltage / ***110 kV or above voltage/ ****66 kV or above voltage transmission line as on date of NOA.

(* Applicable for 765kV voltage level)
(** Applicable for 400kV voltage level)
(***Applicable for 220kV voltage level)
(**** Applicable for 132kV or below voltage level)

In case the Contractor is proposing supply of pole structures from his sub-vendors(s), the Contractor will be required to furnish a Joint Deed of Undertaking

(Format enclosed at Annexure-E) along with the manufacturer(s) to guarantee quality & timely supply of pole structures and confirming to furnish a performance guarantee of 2% of the cost of such transmission line pole structures, at the time of finalizing the manufacturer(s), during execution of the Contract.

2.43 Licensor-Licensee conditions (Applicable for items other than HTLS Conductor)

(i) Manufacturer/licensees shall have adequate design infrastructure and manufacturing facility and capacity and procedures including quality control.

(ii) A qualified Licensee of a qualified manufacturer shall comply with all of the following requirements and furnish a joint undertaking by the licensor along with the bid.

a) Any design undertaken by the licensee shall be approved by the licensor.

b) Manufacture by the licensee shall be done with the approval of the licensor and Employer under a quality assurance programme approved and monitored by the licensor.

c) Licensee must furnish back-up guarantee from the licensor for individual and overall performance of all materials supplied under the contract.

d) Licensor must guarantee sequential and timely supply of materials and submission of technical information and data as desired by the Employer so as to meet the overall construction schedule and

e) The agreement between licensee and licensor (copy to be submitted along with the undertaking as per, Proforma enclosed as ***Annexure–F*** to this section) shall be valid for a period of at least five (5) years after the guarantee period of equipment and materials under supply is over.

2.44 Licensor-Licensee conditions (Applicable for HTLS Conductor)

(i) Manufacturer/ Licensee shall furnish a legally enforceable joint undertaking by the Licensor along with the Licensee in the bid to guarantee following requirement:-

a) Any design undertaken by the Licensee shall be approved by the Licensor.

b) Manufacturing by the Licensee shall be done with the approval of the Licensor under a quality assurance programme approved and monitored by the licensor.

c) In addition to the Contract Performance Security to be furnished by the Contractor, the Licensor shall furnish back-up performance security in the form of bank guarantee for 5% of the Ex-works cost of the HTLS conductor as per the format provided for successful performance of HTLS

conductor to be manufactured and supplied by the Licensee under the contract.

d) Licensor must guarantee sequential and timely supply of materials and submission of technical information and data as desired by the Employer so as to meet the overall construction schedule and

e) The agreement between licensee and licensor (copy to be submitted along with the undertaking as per Proforma enclosed as **Annexure-G** to this section) shall be valid for a period of at least two (2) years after the guarantee period of equipment and materials under supply is over.

2.45 In case manufacturer is a holding company, the technical experience referred to in above clauses shall be of that holding company only (i.e. excluding its subsidiary/ group companies). In case manufacturer is a subsidiary of a holding company, the technical experience referred to in above clauses shall be of that subsidiary company only (i.e. excluding its holding companies)

Note: $ Satisfactory operation under above clauses means certificate issued by the Employer certifying the operation without adverse remark.

2.46 Technical requirement of Sub-Contractors

2.46.1 The subcontractor must have either of the following experience of having successfully completed similar works during last 7 years as on the last day of month previous to the one in which the sub-contractor is proposed to be engaged:

a) Three similar works costing not less than the amount equal to 40% of the cost of the work to be sub-contracted

OR

b) Two similar works costing not less than the amount equal to 50% of the cost of the work to be sub-contracted

OR

c) One similar work costing not less than the amount equal to 80% of the cost of the work to be sub-contracted

2.46.2 Minimum Average Annual Turnover* (MAAT) for best three years i.e. 36 months out of last five financial years of the sub-contractor should be ……

*Annual Gross Revenue from operations/ Gross operating income as incorporated in the profit & loss account excluding other operating income/Other Income.

Note:

1. Similar work shall mean the work which are of similar in nature to the work to be sub-contracted e.g. for the scope of civil work to be sub contracted, the experience should be of civil work.
2. The aforesaid qualifying requirement shall however, not be applicable for engaging labour as per extant policy.
3. The cost of the work to be sub-contracted shall be considered as available in the Contract Agreement. However, if the value is not available in the Contract Agreement, the same shall be the estimated value for such work.
4. The above criteria is in addition to extant policy on selection of sub-contractor as per WPPP, Vol-II.
5. The MAAT requirement shall be worked out basis the following formula: Minimum Average Annual Turnover (MAAT)= Cost of the work to be sub-contracted x1.5/Completion period in years**

**The completion period shall be considered as 1 year even if the same is less than 1 year

3.0 General aspects of Employer design Towers

3.1 Tower Extensions

3.1.1 Provisions for tower extensions shall be as per clause 1.2 of Section IV A of technical specification

3.1.2 All above extension provisions to towers and foundations shall be treated as part of normal towers and foundations only.

3.2 Span and clearances

Span and clearances given in following clauses are indicative. Span & Clearances to be adopted for the specific package shall be as per Tower Spotting Data to be given to the contractor during execution stage.

3.2.1 Normal Span

The normal ruling span of the line of different voltage level is given in the table below:

Sl. No.	Voltage Level of Transmission Line	Design Span or Normal Ruling Span
A)	400 kV, 765 kV, ±500 kV HVDC and ±800 kV HVDC	400 meters

B)	220 kV	350 meters
C)	132 kV	320 meters

3.2.2 Wind Span

The wind span is the sum of the two half spans adjacent to the support under consideration. For normal horizontal spans this equals to normal ruling span.

3.2.3 Weight span

The weight span is the horizontal distance between the null points of the conductors on the two spans adjacent to the tower.

3.2.4 In case at certain locations, actual spans are found to be exceeding the design spans and cross-arms/ other members of towers are required to be modified/ reinforced, the tower shall be modified/ reinforced by the contractor based on drawings supplied to the Contractor.

4.0 Details of Line Materials

4.1 AC Lines

4.1.1 765 kV Voltage level

A) 765 kV Single Circuit Transmission Line with Horizontal / DELTA/ Vertical Delta Configuration

1	**Conductor**	Four ACSR BERSIMIS conductor per phase with sub-conductor spacing of 457 mm in Horizontal/ Delta configuration.
2	**Earthwire/ OPGW**	Two Earthwires (7/3.66mm) or One Earthwire (7/3.66mm) and one OPGW or Two OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in Section-IA.
3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Single 'I' suspension Pilot	120
b)	Double 'I' suspension	240

c)	Single 'V' suspension Pilot	120 (Along one arm)
d)	Single Tension	120
e)	Single 'V' suspension	210 (Along one arm)
f)	Double 'V' suspension	420 (Along one arm)
g)	Quadruple Tension	840

B) 765 kV Double Circuit Transmission Line

1	**Conductor**	Six ACSR ZEBRA conductor per phase with sub-conductor spacing of 457 mm in vertical configuration.
2	**Earthwire / OPGW**	Two Earthwires (7/3.66mm) or One Earthwire (7/3.66mm) and one OPGW or Two OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in Section-IA.
	Insulator String details	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Double 'I' suspension	320
b)	Single 'I' suspension Pilot	160
c)	Single Tension	160
d)	Quadruple Tension	840

4.1.2 400 kV Voltage Level

A) 400kV Double Circuit (QUAD ACSR MOOSE) Transmission Line

1	**Conductor**	Four ACSR MOOSE conductor per phase with sub-conductor spacing of 457 mm in vertical configuration.
2	**Earthwire / OPGW**	Two Earthwires (7/3.66mm) or One Earthwire (7/3.66mm) and one OPGW or Two OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in Section-IA.

3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Double 'I' suspension	240
b)	Single 'I' suspension Pilot	120
c)	Single Tension	120
d)	Quadruple Tension	640

B) 400 kV Single/Double Circuit (TWIN ACSR MOOSE) Transmission Line

1	**Conductor**	Two ACSR MOOSE conductor per phase with sub-conductor spacing of 450 mm.
2	**Earthwire / OPGW**	Two Earthwires (7/3.66mm) or One Earthwire (7/3.66mm) and one OPGW or Two OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in Section-IA.
3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Single 'I' Suspension	120
b)	Single 'I' suspension Pilot	120
c)	Single Tension	120
d)	Double Tension	320

C) 400 kV Double Circuit (triple ACSR SNOWBIRD) Transmission Line

1	**Conductor**	Triple ACSR Snowbird conductor per phase with sub-conductor spacing of 457 mm.
2	**Earthwire / OPGW**	Two Earthwires (7/3.66mm) or One Earthwire (7/3.66mm) and one OPGW or Two OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in Section-IA.
3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**

a)	Double 'I' Suspension	240
b)	Single 'I' suspension Pilot	120
c)	Single Tension	120
d)	Double Tension	420

D) 400 kV Double Circuit (twin ACSR LAPWING) Transmission Line

1	**Conductor**	Twin ACSR Lapwing conductor per phase with sub-conductor spacing of 450 mm.
2	**Earthwire / OPGW**	Two Earthwires (7/3.66mm) or One Earthwire (7/3.66mm) and one OPGW or Two OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in Section-IA.
3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Single 'I' Suspension	160
b)	Single 'I' suspension Pilot	160
c)	Single Tension	160
d)	Double Tension	420

4.1.3 220 kV Voltage Level

A) 220kV Single/Double Circuit (Single ACSR Zebra) Transmission Line

1	**Conductor**	ACSR Zebra conductor
2	**Earthwire / OPGW**	One Earthwire (7/3.15mm) or OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in Section-IA.
3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Single 'I' Suspension	70

b)	Single 'I' suspension Pilot	70
c)	Single Tension	120
d)	Double Tension	240

B) 220kV Single/Double Circuit (TWIN ACSR MOOSE) Transmission Line

1	**Conductor**	Two ACSR MOOSE conductor per phase with sub-conductor spacing of 450 mm.
2	**Earthwire / OPGW**	One Earthwires (7/3.66mm) or One OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in Section-IA.
3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Single 'I' Suspension	120
b)	Single 'I' suspension Pilot	120
c)	Single Tension	120
d)	Double Tension	320

4.1.4 132 kV Voltage Level

A) 132kV Single/ Double Circuit Transmission Line with Single ACSR PANTHER Conductor

1	**Conductor**	ACSR Panther conductor
2	**Earthwire / OPGW**	One Earthwire (7/3.15mm) or OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in Section-IA.
3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Single 'I' Suspension	90
b)	Single Tension	90
c)	Double Tension	180

B) **132kV Single/ Double Circuit Transmission Line with Single ACSR ZEBRA Conductor**

1	**Conductor**	ACSR ZEBRA conductor
2	**Earthwire / OPGW**	One Earthwire (7/3.15mm) or OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in Section-IA.
3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Single 'I' Suspension	90
b)	Single Tension	120
c)	Double Tension	240

4.2 HVDC Lines

4.2.1.1 **±800kV HVDC Transmission line**

1	**Conductor**	Four ACSR Lapwing conductor per phase with sub-conductor spacing of 457 mm in Horizontal configuration.
2	**Earthwire/ OPGW**	Two Earthwires (7/4.50mm) or One Earthwire and one OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in section-1 A
3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Single 'Y' suspension	420 along each arm of V portion & 840 along I portion
b)	Triple Tension String	1260
c)	Single I Pilot	160
Details of DMR		
1	Conductor	Twin ACSR Lapwing conductor per phase with sub-conductor spacing of 450 mm in Horizontal configuration.
2	**Insulator String Details**	

	Type of String	Mechanical Strength of Insulator String (kN)
a)	Single "I" Suspension	160/ 210
b)	Double Tension	420

4.2.1.2 **±500kV HVDC Transmission line**

A) ±500kV HVDC with Quad ACSR LAPWING Conductor

1	**Conductor**	Four ACSR Lapwing conductor per phase with sub-conductor spacing of 457 mm in Horizontal configuration.
2	**Earth Electrode line**	Twin ACSR MOOSE conductor per phase with sub-conductor spacing of 450 mm in Horizontal configuration.
3	**Earthwire/ OPGW**	Two Earthwires (7/3.66mm) or One Earthwire and one OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in section-1 A
3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Single 'V' suspension	210 (Along one arm)
b)	Double 'V' suspension	420 (Along one arm)
c)	Quadruple Tension	840

B) ±500kV HVDC With Quad ACSR BERSIMIS Conductor

1	**Conductor**	Four ACSR BERSIMIS conductor per phase with sub-conductor spacing of 457 mm in Horizontal configuration.
2	**Earthwire/ OPGW**	Two Earthwires (7/3.66mm) or One Earthwire and one OPGW with mechanical & electrical properties equivalent to the used earthwire may be used as indicated in section-1A
3	**Insulator String details**	
	Type of String	**Mechanical Strength of Insulator String (kN)**
a)	Single 'V' suspension	210 (Along one arm)
b)	Quadruple Tension	640

5.0 Electrical System Data for Different Voltage of Line.

5.1 AC lines

Sl. No.	Parameters	Unit	Values				
1	Nominal Voltage	kV	765	400	220	32	66
2	Maximum system voltage	kV	800	420	245	145	72
3	BIL (Impulse)	kV (Peak)	2400	1550	1050	650	325
4	Power frequency withstand voltage (Wet)	kV (rms)	830	680	460	275	175
5	Switching surge withstand voltage (Wet)	kV (peak)	1550	1050	NA	NA	NA
6	Minimum Corona extinction voltage at 50 Hz AC system under dry condition	kV (rms) phase to earth	510	320	154	NA	NA
7	Radio interference voltage at one MHz for phase to earth voltage as indicated under dry condition.	Micro Volts (Max)	1000 at 510 kV	1000 at 305 kV	1000 at 154 kV	NA	NA

5.2 HVDC transmission line

Sl. No.	Parameters	Unit	Value	
1	Nominal Voltage	kV	±500	±800
2	Maximum system voltage	kV	±525	±840
3	BIL (Impulse)	kV (Peak)	1800	2250
4	Switching surge withstand voltage (Wet)	kV (peak)	1000	1850

5	Minimum Corona extinction voltage under dry condition	kV (rms)	550	880
6	Maximum Radio interference voltage at one MHz for conductor surface gradient of 22 kV/cm (positive)	Micro Volts	1000	1000

6.0 Planning and Designing in Purview of Vulnerability Atlas of India

Vulnerability Atlas of India (VAI) is a comprehensive document which provides existing hazard scenario for the entire country and presents the digitized State/ UT wise hazard, maps with respect to earthquakes, winds and floods for district-wise identification of vulnerable areas. It also includes additional digitized maps for thunderstorms, cyclones and landslides. The main purpose of this Atlas is its use for disaster preparedness and mitigation at policy planning and project formulation stage.

This Atlas is one of its kind single point source for the various stakeholders including policy makers, administrators, municipal commissioners, urban managers, engineers, architects, planners, public etc. to ascertain proneness of any city/ location/ site to multi-hazard, which includes earthquakes, winds, floods thunderstorms, cyclones and landslides. While project formulation, approvals and implementation of various urban housing, buildings and infrastructures schemes, this Atlas provides necessary information for risk analysis and hazard assessment.

The Vulnerability Atlas of India has been prepared by Building Materials and Technology Promotion Council under Ministry of Housing and Urban Affairs, Government of Indra and available at their website www.bmtpc.org. It is mandatory for the bidders to refer Vulnerability Atlas of India for multi-hazard risk assessment and include the relevant hazard proneness specific to project location while planning and designing the project in terms of:

i) Seismic zone (II to V) for earthquakes,

ii) Wind velocity (Basic Wind Velocity: 55, 50, 47, 44, 39 & 33 m/s)

iii) Area liable to floods and Probable max. surge height

iv) Thunderstorms history

v) Number of cyclonic storms/ severe cyclonic storms and max sustained wind specific to coastal region

vi) Landslides incidences with Annual rainfall normal

vii) District wise Probable Max. Precipitation

Annexure-A

List of Electrical Equipment Class-I Local Supplier and Minimum Local Content Requirement

Sl. No.	List of Electrical Equipment with sufficient local capacity and competition	Class-I Local Supplier- Minimum Local Content (%)
1	Power Transformers (up to 765 kV, including Generator transformers)	60
2	Instrument Transformer (up to 765 kV)	60
3	Transformer Oil Dry Out System (TODOS)	60
4	Reactors up to 765 kV	60
5	Oil Impregnated Bushing (up to 400 kV)	60
6	Resin Insultated Paper (RIP) bushings (up to 145 kV)	50
7	Circuit Breakers (up to 765 kV AC - Alternating Current)	60
8	Disconnectors/Isolators (up to 765 kV AC)	60
9	Wave trap (up to 765 kV AC)	60
10	Oil Filled Distribution Transformers up to & Including 33 kV [Cold Rolled Grain Oriented (CRGO)/Amorphous, Aluminium/Copper wound]	60
11	Dry Type Distribution Transformer upto and including 33 kV (CRGO/Amorphous, Aluminium/Copper wound)	60
12	Conventional Conductor	60
13	Accessories for Conventional conductors	60
14	High Temperature/High Temperature Low Sag (HTLS) conductors (such as Composite core, GAP, ACSS, INVAR, AL59) and Accessories	60
15	Optical ground wire (OPGW) — all designs	60
16	Fiber Optic Terminal Equipment (FOTE) for OPGW	50
17	OPGW related Hardware and Accessories	60

18	Remote Terminal Unit (RTU)	50
19	Power Cables and accessories up to 33 kV	60
20	Control cables including accessories	60
21	XLPE Cables up to 220 kV	60
22	Substation Structures	60
23	Transmission Line Towers	60
24	Porcelain (Disc/Long Rod) Insulators	60
25	Bus Post Insulators (Porcelain)	60.
26	Porcelain Disc Insulators with Room Temperature Vulcanisation (RTV) coating	50
27	Porcelain Longrod Insulators with Room Temperature Vulcanisation (RTV) coating	50
28	Hardware Fittings for Porcelain Insulators	60
29	Composite/Polymeric Long Rod Insulators	60
30	Hardware Fittings for Polymer Insulators	60
31	Bird Flight Diverter (BED)	60
32	Power Line Carrier Communication (PLCC) System (up to 800 kV)	60
33	Gas Insulated Switchgear (up to 400 kV AC)	60
34	Gas Insulated Switchgear (above 400 kV AC)	50
35	Surge/Lightning Arrester (up to 765 kV AC)	60
36	Power Capacitors	60
37	Packaged Sub-station (6.6 kV to 33 kV)	60
38	Ring Main Unit (RMU) (up to 33 kV)	60
39	Medium Voltage (MV) GIS Panels (up to 33 kV)	60
40	Automation and Control System/Supervisory Control and data Acquisition (SCADA) System in Power System	50

41	Control and Relay Panel (including Digital/Numerical Relays)	50
42	Electrical Motors 0.37 kW to 1 MW	60
43	Energy Meters excluding smart meters	50
44	Control & power cables and Accessories (up to 1.1 kV)	60
45	Diesel Generating (DG) set	60
46	DC system (DC Battery & Battery Charger)	60
47	AC & DC Distribution Board	60
48	Indoor Air Insulated Switchgear (AIS) upto 33 kV	60
49	Poles (PCC, PSCC, Rolled Steel Joist, Rail Pole, Spun, Steel Tubular)	60
50	Material for Grounding/earthing system	60
51	Illumination system	60
52	Overhead Fault Sensing Indicator (FSI)	50
53	Power Quality Meters	50
54	Auxilliary Relays	50
55	Load Break Switch	50

Annexure-B

FORM OF JOINT DEED OF UNDERTAKING BY THE TOWER MANUFACTURER ALONGWITH THE BIDDER/ CONTRACTOR

THIS DEED OF UNDERTAKING executed this ……. day of …….. Two Thousand and …… by M/s. ……., a Company incorporated under the laws of …… and having its Registered Office at …….. (hereinafter called the "Tower Manufacturer" which expression shall include its successors, executors and permitted assigns), and M/s. ……., a Company incorporated under the laws of ……. having its Registered Office at …… (hereinafter called the "Bidder"/"Contractor" which expression shall include its successors, executors and permitted assigns) in favour of …….. *(insert names of the Employer)* ……., a Company incorporated under the Companies Act of 1956 having its registered office at ……*(insert registered address of the Employer)*…… (hereinafter called the "Employer" which expression shall include its successors, executors and permitted assigns)

WHEREAS the "Employer" invited Bid as per its Specification No. …….. for manufacture, fabrication, supply of tower parts as per Contractor‟s/ Employer‟s design **(wherever applicable),** casting of foundation, erection of all types of towers, stringing of conductor and earthwire, testing and commissioning of ……Transmission Line.

AND WHEREAS Clause No. ……., Section ……, of ……, Vol.–… forming part of the Bid Documents inter-alia stipulates that the Bidder and/or Manufacturer must fulfill the Qualifying Requirements and be jointly and severally bound and responsible for the quality and timely supply of tower parts in the event the Bid submitted by the Bidder is accepted by the Employer resulting in a Contract.

AND WHEREAS the Bidder has submitted its Bid to the Employer vide Proposal No. ……. dated ……. based on tie-up with the Tower Manufacturer for supply of tower parts.

NOW THEREFORE THIS UNDERTAKING WITNESSETH as under:

1. In consideration of the award of Contract by the Employer to the Bidder (hereinafter referred to as the "Contract") we, the Tower Manufacturer and the Bidder/Contractor do hereby declare that we shall be jointly and severally bound unto the …… *(insert name of the Employer)* ……, for the manufacture, testing, supply of tower parts on FOR destination delivery at site basis in accordance with the Contract Specifications.

2. Without in any way affecting the generality and total responsibility in terms of this Deed of Undertaking, the Tower Manufacturer hereby agrees to depute their representatives from time to time to the Employer‟s Project site as mutually considered necessary by the Employer, Bidder/Contractor and the Tower

Manufacturer to ensure proper quality, manufacture, testing and supply on FOR destination delivery at site basis and successful performance of the material in accordance with Contract Specifications. Further, if the Employer suffers any loss or damage on account of non-performance of the material (tower parts) fully meeting the performance guaranteed as per Bid Specification in terms of the contract. We the Tower Manufacturer and the Contractor jointly and severally undertake to pay such loss or damages to the Employer on its demand without any demur.

3. This Deed of Undertaking shall be construed and interpreted in accordance with the laws of India and the Courts in Delhi shall have exclusive jurisdiction in all matters arising under the Undertaking.

4. We, the Tower Manufacture/ Bidder/Contractor agree that this Undertaking shall be irrevocable and shall form an integral part of the Contract and further agree that this Undertaking shall continue to be enforceable till the Employer discharges it. It shall become operative from the effective date of Contract.

IN WITNESS WHEREOF the Tower Manufacturer and/or the Bidder/Contractor have through their Authorised Representatives executed these presents and affixed Common seals of their respective Companies, on the day, month and year first above mentioned.

WITNESS
Signature …….
Name ……..
Office Address …….

(For Tower Manufacturer)
(Signature of the authorized representative)
Name ……..
Common Seal of Company ……

WITNESS
Signature …….
Name ……..
Office Address …….

(For Bidder)
(Signature of the authorized representative)
Name ……..
Common Seal of Company ……

Annexure-C

Refer OPGW section of technical specification.

ANNEXURE-D

PROFORMA OF UNDERTAKING BY THE PROPOSED SUPPLIER OF CORE OF HTLS CONDUCTOR

(On Non-Judicial Stamp Paper of appropriate value, wherever applicable)

To,

Power Grid Corporation of India Ltd.
B-9, Qutab Institutional Area
Katwaria Sarai
New Delhi - 110016

Dear Sir,

Whereas Power Grid Corporation of India Ltd., with its Registered Office at B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi – 110016 (hereinafter referred to be as the ''), having invited bids for ..... (Name of the package & Specification No.) ....., in response to which M/s. .....(Name of the Bidder), with its Registered office at (Full Address) are submitting the bid vide ref date..... (hereinafter called the 'Bid').

We, ... (Name of the Core supplier) with its Registered Office at..... (Full Address..... (hereinafter referred to as the 'Core Supplier', which expression shall unless repugnant to the context and meaning therefore include its successor, administrator, executor and permitted assigns) do hereby undertake in the event of award of the Contract to supply required quantity of HTLS core for supply of HTLS conductor covered under the scope of the Contract, fulfilling all the requirements and construction schedule agreed under the Contract.

Signed on this day of ..... 2021 at.....

(Signature) .....
Authorised signatory on behalf of
M/s.....
(Name) .....
(Designation.....

Note: Separate undertaking to be provided in case of more than one core supplier proposed.

ANNEXURE-E

FORM OF JOINT DEED OF UNDERTAKING BY THE POLE MANUFACTURER ALONGWITH THE BIDDER/CONTRACTOR

THIS DEED OF UNDERTAKING executed this …… day of Two Thousand and …… by M/s. ……., a Company incorporated under the laws of and having its Registered Office at …….. (hereinafter called the "Pole Manufacturer" which expression shall include its successors, executors and permitted assigns), and M/s. ……., a Company incorporated under the laws of having its Registered Office at ……. (hereinafter called the "Bidder"/"Contractor" which expression shall include its successors, executors and permitted assigns) in favour of …….. *(insert names of the Employer)* , a Company incorporated under the Companies Act of 1956 having its registered office at ……*(insert registered address of the Employer)*…… (hereinafter called the "Employer" which expression shall include itssuccessors, executors and permitted assigns).

WHEREAS the "Employer" invited Bid as per its Specification No……..for manufacture, fabrication, supply of tower parts as per Contractor's/ Employer's design **(wherever applicable),** casting of foundation, erection of all types of poles, stringing of conductor and earthwire, testing and commissioning of Transmission Line.

AND WHEREAS Clause No. ……., Section ……, of ……, Vol…… forming part of the Bid Documents inter-alia stipulates that the Bidder and/or Manufacturer must fulfill the Qualifying Requirements and be jointly and severally bound and responsible for the quality and timely supply of pole parts in the event the Bid submitted by the Bidder is accepted bythe Employer resulting in a Contract.

AND WHEREAS the Bidder has submitted its Bid to the Employer vide Proposal No. ……. dated …… based on tie-up with the Tower Manufacturer for supply of pole parts.

NOW THEREFORE THIS UNDERTAKING WITNESSETH as under:

1. In consideration of the award of Contract by the Employer to the Bidder (hereinafter referred to as the "Contract") we, the Pole Manufacturer and the Bidder/Contractor do hereby declare that we shall be jointly and severally bound unto the …… *(insert name of the Employer)……* , for the manufacture, testing, supply of pole parts on FOR destination delivery at site basis in accordance with the Contract Specifications.

2. Without in any way affecting the generality and total responsibility in terms of this Deed of Undertaking, the Pole Manufacturer hereby agrees to depute their representatives from time to time to the Employer's Project site as mutually considered necessary by the Employer, Bidder/ Contractor and the Pole Manufacturer to ensure proper quality, manufacture, testing and supply on FOR destination delivery at site basis and successful performance of the material in accordance with Contract Specifications. Further, if the Employer suffers any loss or

damage on account of non-performance of the material (pole parts) fully meeting the performance guaranteed as per Bid Specification in terms of the contract. We thePole Manufacturer and the Contractor jointly and severally undertake to pay such loss or damages to the Employer on its demand without any demur.

3. This Deed of Undertaking shall be construed and interpreted in accordance with the laws of India and the Courts in Delhi shall have exclusive jurisdiction in all matters arising under the Undertaking.

4. As a security, the Pole Manufacturer shall apart from the Contractor's performance guarantee, furnish a Contract Performance Guarantee from its Bank in favour of the Employer in a form acceptable to the Employer. The value of such guarantee shall be equivalent to **02%** of the cost of pole parts to be supplied by the Pole Manufacturer as identified in the Contract awarded by the Employer to the Bidder/ Contractor and itshall be part of guarantee towards the faithful performance/ compliance of this Deed of Undertaking in terms of the Contract. The guarantee shall be unconditional, irrevocable and valid for the entire period of the Contract, namely till the end of the Defect Liability Period of under the Contract. The Bank Guarantee amount shall be payable to the Employer on demand without any reservation or demur.

5. We, the Pole Manufacture/ Bidder/Contractor agree that this Undertaking shall be irrevocable and shall form an integral part of the Contract and further agree that thisUndertaking shall continue to be enforceable till the Employer discharges it. It shall become operative from the effective date of Contract.

IN WITNESS WHEREOF the Pole Manufacturer and/or the Bidder/Contractor have through their Authorised Representatives executed these presents and affixed Common seals of theirrespective Companies, on the day, month and year first above mentioned.

WITNESS	(For Pole Manufacturer)
Signature ……..	(Signature of authorize representative)
Name ……	Name ……
Office Address ……	Common Seal of Company
WITNESS	(For Bidder)
Signature ……..	(Signature of authorize representative)
Name ……	Name ……
Office Address ……	Common Seal of Company

Annexure-F

FORM OF JOINT UNDERTAKING BY THE LICENSOR ALONGWITH THE LICENSEE (APPLICABLE FOR ITEMS OTHER THAN HTLS CONDUCTOR)

On Non-Judicial Stamp Paper of Appropriate Value

THIS DEED OF UNDERTAKING executed this ..... day of ..... Two Thousand ..... by ..... a Company incorporated under the laws of ..... and having its Registered Office at ..... (hereinafter called the "Licensor" which expression shall include its successors, executors and permitted assigns) and ..... a Company incorporated under the Companies Act, 1956 having its Registered Office at ..... (hereinafter called the "Licensee" which expression shall include its successors, executors and permitted assigns) in favour of Power Grid Corporation of India Ltd., having its Registered Office at B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi-110016 (hereinafter called the "Employer" which expression shall include its successors, executors and permitted assigns).

WHEREAS the Employer invited Bids as per its Specification No. ..... for the construction of transmission line which inter alia include design, manufacture, testing, supply on Final Destination delivery at site basis for Composite Insulator*, Conductor*, Hardware Fittings* and Accessories for Conductor & Earthwire*-for ..... Transmission Lines.

AND WHEREAS Clause no. ……., Section ……., of ……, Vol.–… forming part of the Bidding Documents inter alia stipulates that the Licensee along with its Licensor must fulfill the Qualifying Requirements and be jointly and severally bound and responsible for the successful performance of the equipment and shall be fully responsible for the design, manufacture, testing, supply and final destination delivery at site basis in the event the Bid is accepted by the Employer resulting in a "Contract".

AND WHEREAS ..... a company incorporated Companies Act 1956, having its Registered Office at ..... (hereinafter called the "Bidder"/"Contractor" which expression shall include its successors, executors and permitted assigns) the Bidder has submitted its Bid for the Employer for ..... Transmission Line having Specification No. ..... vide Proposal No. ..... dated ..... based on the License of the Licensor.

NOW THEREFORE THIS UNDERTAKING WITNESSETH AS UNDER:

1.0 In consideration of the award of Contract by the Employer to the Bidder (hereinafter referred to as the "Contract") we, the Licensor and the Licensee do hereby declare that we shall be jointly and severally bound unto the Power Grid Corporation of India Ltd. (Employer)/the Bidder for the successful performance of the equipment and shall be fully responsible for the design, manufacture, testing, supply and final destination delivery at site basis and successful performance of equipment in accordance with the Contract specifications.

2.0 Without in any way affecting the generality and total responsibility in terms of this Deed of Undertaking the Licensor in particular hereby agrees to depute their technical experts to the Licensee's works as considered necessary by the Employer, Bidder and the Licensor to ensure proper design, manufacture, Quality Management, testing, supply on final destination delivery at site basis and successful performance of the equipment in accordance with Contract Specifications and if necessary the Licensor shall advise the Licensee suitable modifications of the designs and implement necessary corrective measures to discharge the obligations under the Contract.

3.0 As a security, the Licensor shall apart from the Contractor's performance guarantee, furnish a Performance Security from its Bank in favour of the Employer in a form acceptable to Employer. The value of such guarantee shall be equal to 5% of the Contract Price of equipment/material proposed to be manufactured and supplied by the Licensee under the contract awarded by the Employer to the Contractor and it shall be part of guarantee towards the faithful performance/compliance of this Deed of Undertaking in terms of the Contract. The Guarantee shall be unconditional, irrevocable and valid for the entire period of the contract, namely till the end of the warranty period of ..... package under the Contract. The Bank Guarantee amount shall be payable to the Employer on demand without any reservation or demur.

4.0 We, the Licensor undertakes to guarantee sequential and timely supply of equipments and materials and submission of technical information and data as designed of the Employer so as to meet the overall construction schedule.

5.0 We, the Licensor and the Licensee confirm that the License agreement shall be valid for a period of at least five (5) years after the guarantee period of the equipment and materials to be supplied under the Contract is over.

6.0 This Deed of Undertaking shall be constructed and interpreted in accordance with the Laws of India and the courts in Delhi shall have exclusive jurisdiction in all matters arising under the undertaking.

7.0 We the Licensor and the Licensee agree that this undertaking shall be irrevocable and shall form an integral part of the Contract and further agree that this undertaking shall continue to be enforceable till the Employer and the Bidder discharge it. It shall become operative from the effective date of Contract.

IN WITNESS WHEREOF the Licensor and the Licensee have through their authorised Representative executed these presents and affixed Common Seals of their respective Companies, on the day, month and year first above mentioned.

	WITNESS	**FOR LICENSEE**
1.	.....	.....
	(Signatures)	(Signature of Authorised Representative)
	.....	.....
	(Name in Block Letter)	(Name)
	.....	Designation .....
	(Office Address)	Common Seal of Company

	WITNESS	**FOR LICENSOR**
1.	.....	.....
	(Signatures)	(Signature of Authorised Representative)
	.....	.....
	(Name in Block Letter)	(Name)
	.....	Designation .....
	(Office Address)	Common Seal of Company

Note : (i) This deed of joint undertaking should be attested by Notary Public of the place of the respective executants.

(ii) To be filled separately for each package.

Annexure-G

FORM OF JOINT UNDERTAKING BY THE LICENSOR ALONGWITH THE LICENSEE (APPLICABLE FOR HTLS CONDUCTOR)

On Non-Judicial Stamp Paper of Appropriate Value

THIS DEED OF UNDERTAKING executed this ……. day of …….. Two Thousand and …… by M/s. ……., a Company incorporated under the laws of …… and having its Registered Office at …….. (hereinafter called the "Licensor" which expression shall include its successors, executors and permitted assigns), and M/s. ……., a Company incorporated under the laws of ……. having its Registered Office at ……. (hereinafter called the "Conductor Manufacturer / Licensee / Supplier" which expression shall include its successors, executors and permitted assigns) and Ms/. ……., a Company incorporated under the laws of ……. having its Registered Office at …….. (hereinafter called the "Bidder" which expression shall include its successors, executors and permitted assigns) in favour of …….. *(insert names of the Employer)* ……., a Company incorporated under the Companies Act of 1956 having its registered office at ……*(insert registered address of the Employer)*…… (hereinafter called the "Employer" which expression shall include its successors, executors and permitted assigns).

WHEREAS the "Employer" invited Bid as per its Specification No. ……. for the execution of ……*(insert name of the package alongwith project name)*……..

AND WHEREAS Clause No. ……., Section ……, of ……, Vol.–… forming part of the Bidding Documents inter-alia stipulates that the Licensee along with its Licensor must fulfill the Qualifying Requirements and be jointly and severally bound and responsible for the successful performance of the equipment offered in the event the Bid submitted by the Bidder is accepted by the Employer resulting in a Contract.

AND WHEREAS the Bidder has submitted its Bid to the Employer vide Proposal No. ……. dated ……. based on Licensee of the Licensor.

NOW THEREFORE THIS UNDERTAKING WITNESSETH AS UNDER :

1.0 In consideration of the award of Contract by the Employer to the Bidder (hereinafter referred to as the "Contract") we, the Licensor and the Bidder/Supplier do hereby declare that we shall be jointly and severally bound unto the ……*(name of the Employer)*……., for the successful performance of the Contract and shall be fully responsible for the design, manufacture, testing, supply on final destination delivery at site basis and successful performance of the equipment in accordance with the Contract specifications.

2.0 Without in any way affecting the generality and total responsibility in terms of this Deed of Undertaking the Licensor in particular hereby agrees to depute their technical experts to the Supplier's Works/Employer's Project site as considered necessary by the Employer, Supplier and the Licensor to ensure proper design, manufacture, Quality Management, testing, supply on final destination delivery at site basis and successful performance of the goods in accordance with the Contract specifications and if necessary the Licensor shall advise the Supplier suitable modifications of the designs and implement necessary corrective measures to discharge the obligations under the Contract.

3.0 This Deed of Undertaking shall be constructed and interpreted in accordance with the Laws of India and the courts in Delhi shall have exclusive jurisdiction in all matters arising under the undertaking.

4.0 As a security, the Licensor shall apart from the Contract Performance Guarantee and Supplier's performance guarantee, furnish a Contract Performance Guarantee from its Bank in favour of the Employer in a form acceptable to the Employer. The value of such guarantee shall be equal to **5% (Five percent)** of the Ex-works cost of the **HTLS Conductor** proposed to be manufactured and supplied by the Supplier under the contract and it shall be part of guarantee towards the faithful performance/compliance of this Deed of Undertaking in terms of the Contract. The Guarantee shall be unconditional, irrevocable and valid for the entire period of the contract, namely till the end of the Defect Liability Period under the Contract. The Bank Guarantee amount shall be payable to the Employer on demand without any reservation or demur.

5.0 We, the Licensor undertakes to guarantee sequential and timely supply of equipments and materials and submission of technical information and data as desired by the Employer so as to meet the overall construction schedule.

6.0 We, the Licensor and the Bidder /Supplier confirm that the licensee agreement shall be valid for a period of at least two (2) years after the guarantee period of the goods to be supplied under the Contract is over.

7.0 We the Licensor and the Bidder /Supplier agree that this undertaking shall be irrevocable and shall form an integral part of the Contract and further agree that this undertaking shall continue to be enforceable till the Employer discharge it. It shall become operative from the effective date of Contract.

IN WITNESS WHEREOF the Licensor and the Bidder /Supplier have through their Authorized Representatives executed these presents and affixed Common Seals of their respective Companies, on the day, month and year first above mentioned.

WITNESS	(FOR LICENSOR)
……	……
(Signatures)	(Signature of Authorized Representative)
……	……
(Name in Block Letter)	(Name)
……	Designation .....
(Office Address)	Common Seal of Company

WITNESS	(FOR SUPPLIER)
Signature …….	(Signature of the authorized representative)
Name …….	Name …….
Office Address …….	Common Seal of Company …….

WITNESS	(FOR BIDDER)
……	……
(Signatures)	(Signature of Authorized Representative)
……	……
(Name in Block Letter)	(Name)
……	Designation .....
(Office Address)	Common Seal of Company

Note:

1. For the purpose of executing the Deed of Joint Undertaking, the non-judicial stamp papers of appropriate value shall be purchased in the name of executant(s).

2. The Undertaking shall be signed on all the pages by the Authorized representatives of each of the partners and should invariably be witnessed.

3. This Deed of Joint Undertaking duly attested by Notary Public of the place(s) of the respective executant(s), shall be submitted along with the Bid.

4. In the event the Bidder is a Conductor Manufacturer, then the Joint deed of undertaking shall be modified accordingly.