

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

4.2.1.2 ± 500 kV HVDC Transmission line

A) ± 500 kV 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) ± 500 kV 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 India 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 Insulated 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 ofTransmission 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. As a security, the Tower 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 tower parts to be supplied by the Tower Manufacturer as identified in the Contract awarded by the Employer to the Bidder/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 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 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

OPGW FORMS

FORM OF BANK GUARANTEE FOR CONTRACT PERFORMANCE

TO BE SUBMITTED BY THE MANUFACTURER OF OPGW)
STIPULATED IN CLAUSE]
(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

Bank Guarantee No.

Date.....

Contract No.....

.....[Name of Contract].....

To: [Name and address of the Employer]

Dear Ladies and/or Gentlemen,

We refer to the Contract ("the Contract") signed on(insert date of the Contract)..... between you and M/s..... (Name of Contractor), having its Principal place of business at(Address of Contractor) and Registered Office at(Registered address of Contractor) ("the Contractor") concerning (Indicate brief scope of work) for the complete execution of the (insert name of Package along with name of the Project).....

Whereas, the Contractor has agreed to supply the OPGW Manufactured by M/s(Name of Manufacturer), having its Principal place of business at(Address of Manufacturer) and Registered office at(Registered address of Manufacturer)..... (Herein after Referred to as the 'Manufacturer') in collaboration with M/s. (Name of Collaborator/Parent/Principal Company), having its Principal place of business at(Address of Collaborator/Parent/Principal Company) and Registered Office at(Registered address of Collaborator/Parent/Principal Company) (hereinafter referred to as the "Collaborator"), as a pre-requisite for qualification of the the Bidder/Contractor and have submitted a deed of joint undertaking declaring that they are jointly and severally bound and responsible for the successful performance of the said equipment in accordance with the Contract Specifications and that the Manufacturer having agreed to furnish a Contract Performance Guarantee equivalent to (10%) ten per cent of the Ex-works cost of OPGW to be supplied by the Manufacturer/Contractor under the Contract. This CPG shall be in addition to Contract

Performance Guarantee equivalent to 10% (Ten per cent) of the value of the Contract to be provided by the Contractor for the faithful performance of the entire Contract.

By this letter we, the undersigned,(*insert name & address of the issuing bank*), a Bank (or Company) organized under the laws of and having its Registered/Head Office at(*insert address of registered office of the bank*)..... do hereby irrevocably guarantee payment to you up to i.e., ten percent (10%) of the Ex-works cost of OPGW to be supplied by the Manufacturer/Contractor under the Contract until ninety (90) days beyond the Defect Liability Period of the OPGW i.e., upto and inclusive of (*dd/mm/yy*).

We undertake to make payment under this Letter of Guarantee upon receipt by us of your first written demand signed by your duly authorized officer declaring the *Contractor/Manufacturer/ Collaborator/Parent/Principal Company* to be in default under the Contract and without cavil or argument any sum or sums within the above named limits, without your need to prove or show grounds or reasons for your demand and without the right of the *Contractor/Manufacturer/ Collaborator/Parent/Principal Company* to dispute or question such demand.

Our liability under this Letter of Guarantee shall be to pay to you whichever is the lesser of the sum so requested or the amount then guaranteed hereunder in respect of any demand duly made hereunder prior to expiry of the Letter of Guarantee, without being entitled to inquire whether or not this payment is lawfully demanded.

This letter of Guarantee shall remain in full force and shall be valid from the date of issue until ninety (90) days beyond the Defect Liability Period of the said equipment i.e. upto and inclusive of (*dd/mm/yy*) and shall be extended from time to time for such period (not exceeding one year), as may be desired by M/s. on whose behalf this Letter of Guarantee has been given.

Except for the documents herein specified, no other documents or other action shall be required, notwithstanding any applicable law or regulation.

Our liability under this Letter of Guarantee shall become null and void immediately upon its expiry, whether it is returned or not, and no claim may be made hereunder after such expiry or after the aggregate of the sums paid by us to you up shall equal the sums guaranteed hereunder, whichever is the earlier.

All notices to be given under shall be given by registered (airmail) posts to the addressee at the address herein set out or as otherwise advised by and between the parties hereto.

We hereby agree that any part of the Contract may be amended, renewed, extended, modified, compromised, released or discharged by mutual agreement between you and the Collaborator, and this security may be exchanged or surrendered without in any way impairing or affecting our liabilities hereunder without notices to us and without the necessity for any additional endorsement, consent or guarantee by us, provided, however, that the sum guaranteed shall not be increased or decreased.

No action, event or condition which by any applicable law should operate to discharge us from liability hereunder shall have any effect and we hereby waive any right we may have to apply such law so that in all respects our liability hereunder shall be irrevocable and, except as stated herein, unconditional in all respects.

Notwithstanding anything contained herein:

1. Our liability under this Bank Guarantee shall not exceed _____ (value in figures) _____ [_____ (value in words) _____].
2. This Bank Guarantee shall be valid upto _____ (validity date) _____.
3. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only & only if we receive a written claim or demand on or before _____ (validity date) _____."

For and on behalf of the Bank

[Signature of the authorized signatory(ies)]

Signature _____

Name _____

Designation _____

POA Number _____

Contact Number(s): Tel. _____ Mobile _____

Fax Number _____

email _____

Common Seal of the
Bank _____

Witness:

Signature _____

Name _____

Address _____

Contact Number(s): Tel. _____ Mobile _____
email _____

Note:

1. For the purpose of executing the Bank Guarantee, the non-judicial stamp papers of appropriate value shall be purchased in the name of Bank who issues the 'Bank Guarantee'.
2. The Bank Guarantee shall be signed on all the pages by the Bank Authorities indicating their POA nos. and should invariably be witnessed.
3. **The Bank Guarantee should be in accordance with the proforma as provided. However, in case the issuing bank insists for additional paragraph regarding applicability of ICC publication No: 758, the following may be added at the end of the proforma of the Bank Guarantee [i.e., end paragraph of the Bank Guarantee preceding the signature(s) of the issuing authority(ies) of the Bank Guarantee]:**
"This Guarantee is subject to Uniform Rules for Demand Guarantee, ICC publication No. 758 except that article 15(a) is hereby excluded."
4. At the time of issuance of the Bank Guarantee (including its extensions) through SFMS facility, the issuing bank will input the IFSC code of Beneficiary Bank as mentioned at GCC clause 9.4 in SCC in their Trade Finance Portal.
Additional paragraph regarding issuance of the Bank Guarantee through SFMS Platform (if applicable), the following should be added at the end of the proforma of the Bank Guarantee [i.e., end paragraph of the Bank Guarantee preceding the signature(s) of the issuing authority(ies) of the Bank Guarantee]:

"This Guarantee has been issued using SFMS Platform and the requisite communication in this regard has been forwarded to the Beneficiary Bank."

FORM OF DEED OF UNDERTAKING BY THE CONTRACTOR

**TO BE EXECUTED BY THE BIDDER/MANUFACTURER FOR EXTENDED WARRANTY OF
ONE (01) YEARS OVER AND ABOVE THE WARRANTY PERIOD SPECIFIED FOR OPGW
CABLE**

[STIPULATED IN CLAUSE]
(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

**(Declaration by Contractor regarding _____ for GTR/Qualifying
Requirements for manufacturer of OPGW)**

THIS DEED OF UNDERTAKING executed this day of Two Thousand and by M/s., a Company incorporated under the laws of having its Registered Office at (hereinafter called the “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 the execution of (*insert name of the package along with project name*).....

AND WHEREAS Clause No., Section, of, Vol.—... forming part of the Bid Documents inter-alia stipulates that the Contractor must fulfill the General Technical Requirements for OPGW in the event of award/or post award stage and shall be bound and responsible for the successful performance of OPGW offered in the event the Bid submitted by the Contractor is accepted by the Employer resulting in a Contract.

AND WHEREAS the Contractor has submitted its Bid to the Employer vide Proposal No. dated

NOW THEREFORE THIS UNDERTAKING WITNESSETH as under:

1.0 In consideration of the award of Contract by the Employer to the Contractor (hereinafter referred to as the “Contract”) we, the Contractor do hereby undertake that we shall be bound unto the (*insert name of the Employer*), for the successful performance of OPGW and shall be fully responsible for the design, manufacture, testing, supply on FOR destination delivery at site basis and unloading at site, storage, erection, testing & commissioning and successful performance of OPGW in accordance with the Contract Specifications.

2.0 We confirm **the extended warranty obligations of additional one (01) year over and above the warranty period specified for the entire quantity of OPGW to be supplied from the Contractor.**

3.0 We, the 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.

4.0 We, the Bidder/Manufacturer 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.

5.0 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.

IN WITNESS WHEREOF the 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

(For Contractor)

Signature

Name

Office Address

(Signature of the authorized
representative)

Name

Common Seal of Company

WITNESS

WITNESS

Signature

Signature

Name

Name

Office Address

Office Address

Note:

1. For the purpose of executing the Deed of Undertaking, the non-judicial stamp papers of appropriate value shall be purchased in the name of executants parties.
2. The Undertaking shall be signed on all the pages by the authorised representatives of Contractor should invariably be witnessed.
3. This Deed of Joint Undertaking attested by Notary Public of the place(s) of the respective executant(s) shall be submitted by the Contractor after finalization of vendor for OPGW as per TS in the event of award/ post award stage.

*** *Strike-off whichever is not applicable.***