

POWER GRID COMPANY OF BANGLADESH LIMITED

DESIGN, SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF PATUAKHALI (PAYRA) -
GOPALGANJ 400KV TRANSMISSION LINE ON TURNKEY BASIS

CLARIFICATION NO. 2

After issuance of CLARIFICATION NO. 1 and ADDENDUM NO. 1 dated on October 24, 2016, some more queries have been received. Clarifications to the queries received from the prospective bidders regarding the bidding document is given below. Also the updated purchaser list of the bidding document is enclosed herewith [Attachment-1].

Volume 1 of 3

Query 1: Vol.1, Section III, 2.7.Manufacturers/Subcontractor, Fittings for ACCC

There are two types of fittings manufacturer in the Vol.1, Section III, 2.7 Manufacturer/Subcontractor. One is for conductor & insulator (for ACCC), the other is for conductor, insulator & OPGW. We understand that fittings for conductor & insulator (for ACCC) comprise only mid-span joint and dead-end clamp.

Accordingly, apart from that, contractor may select a fittings manufacturer for conductor, insulator & OPGW such as suspension sets, spacer dampers as well as a fittings manufacturer for conductor & insulator (for ACCC).
Is our understanding correct?

Answer 1: Your understanding is not correct. All fittings except special tube for ACCC conductor shall be supplied from same manufacturer. The special tube for ACCC generally supplied by the conductor manufacturer.

Query 2: Volume I. Clause 10.2 of Section VIII. SCC states that, "contractor shall be responsible for acquiring and providing legal and physical possession of the transmission line sites and access thereto"

In this regard when the land owner does not agree, please advise how the employer would give support the contractor in detail it's being out of contractor's control.

Answer 2: Employer will provide necessary administrative support at the contractor's cost (if any).

Query 3: Volume I. Clause 10.3 of Section VIII. SCC states that, "Contractor shall acquire and pay for all permits, approvals and/or licenses from local, state or national government authorities or public service undertaking in the country where the site is located."

~~In this regard when the local, state or national government authorities or public service do not agree, please advise how the employer would give support the contractor in detail it's being out of contractor's control.~~

Answer 3: Employer will provide necessary administrative support at the contractor's cost (if any).

Query 4: **Taxes & Duties :**
As per clause 14.2 (b), Section – VIII, SCC:

"For Other Schedule,

Applicable VAT will be borne by the Employer and consequently, all bid prices shall be exclusive of VAT."

From the above clause, we understand that PGCB (Employer) will not deduct any kind of VAT as **VDS (VAT deductible at Source)** from the payment of Contractor's Bill against Price Schedule No. 3 & Schedule No. 4 and PGCB will pay applicable VAT from their own fund & issue the certificate of such payment to Government.

We request you to kindly arrange to confirm whether our above understanding is in line with tender documents or not. This will enable us to assess the exact tax implication and to avoid unnecessary loading in our quoted prices towards tax.

Answer 4: The above matter is clearly mentioned in bidding document. Please go through carefully.

Query 5: **Taxes & Duties :**
As per clause 14.1, Section – VIII, SCC:

"VAT on EXW amounts is not included in the contract price. VAT on EXW shall be paid by the Contractor and shall be reimbursed by the Employer to the Contractor on actual basis in accordance with the government rules upon submission of relevant documents in original."

As per above tender clause / clarifications, applicable VAT has to be first paid by contractor to Govt. agency and then Employer (PGCB) shall reimburse the same as per actual to the contractor.

We understand that PGCB will reimburse applicable VAT on Total Gross Amount (i.e. 100% applicable VAT on total quoted prices). Please Clarify our understanding.

Example –

Suppose, ABC-India (Main Contractor to PGCB) procure Steel Towers from M/s. XYZ – Dhaka.

XYZ as a Manufacturer supplies materials (worth BTK 100) to ABC by loading 15% VAT with VAT challan. (i.e. BTK 100 Exw + 15 VAT = BTK 115 invoice raised to ABC)

Further, ABC add BTK 20 as a margin on XYZ's Exw cost excluding VAT and sell it to PGCB. (i.e. BTK 100 XYZ's Exw cost + BTK 20 of ABC = BTK 120 sale price to PGCB)

VAT @ 15% also applicable on ABC sale price BTK 120 i.e. $120 \times 15\% = 18$ BTK VAT, which is payable by PGCB to the Contractor.

Out of the above mentioned 18 BTK VAT, ABC will reimburse 15 BTK to XYZ on account of VAT and will pay balance 3 BTK to VAT authority. (ABC will maintain proper accounting of input materials).

Accordingly, PGCB will reimburse total BTK 18 on account of VAT (i.e. 15% VAT on BTK 120 i.e. ABC's sale price, out of which BTK 3 will be paid by ABC to VAT Authority and BTK 15 (the amount paid by XYZ to VAT Authority) will be reimbursed by ABC to XYZ).

Kindly arrange to confirm / clarify, whether our above understanding is in line with tender conditions & prevailing Bangladesh rules or not.

Answer 5: The above matter is clearly mentioned in bidding document. Please go through carefully.

Query 6: **Price Variation for ACCC conductor:**

Please, refer the new price variation formula given for ACCC conductor in Appendix 2 – Price Adjustment / Escalation.

In first para it is mention that **"The formula for calculating the price adjustment of the contract price component of the conductor (ACSR) & OPGW"**.

We request you to kindly arrange to amend the above language suitably to avoid any confusion.

Answer 6: Please refer to Addendum 2.

Query 7: **Insulator String Type Test :**

Please, refer the Clarification-1 reply for Volume 1 of 3 [Answer 45, Answer 54 (e), 54 (f), 54 (g)] and relevant changes in Addendum-1 for Volume 2 of 3 (Sr No. 5, Section – 9, Insulators).

We understand the followings:

- Type Test reports of Insulator string sets not required to be submitted with Bid by the Bidders.
- Only 400kN tension sets for 400KV Overland Portion are required to be type tested during contract execution stage without any extra cost to PGCB.
- If type tests report for 400kN tension insulator sets (for River Crossing Portion) of offered combination of insulator & fittings manufacturer with proposed design are not available, then only fresh type test required to be performed during contract execution stage without any extra cost to PGCB.
- Above Type test required to be conducted in laboratories mentioned in Clause 9.6.2 (i)

We request you to kindly arrange to confirm whether our above understanding is in line with tender documents or not.

Answer 7: Your understanding is correct.

Query 8: Volume I. Appnedix 3 of Section IX. Contract form
"100% of the insurance in the Employer's country shall be made by the Sadharan Bima Corporation, Bangladesh".
please amend the statement as follow "all Insurances taken out by the Contractor shall be made by reputable international insurance companies rated S&P A- or higer" because Sadhran Bima Corporation's rate is generally higher than other sources and there was a considerable disadvantage case that delayed payment of insurance compensation without reason and requesting an additional fee.

Answer 8: Please follow the bidding document.

Query 9: Volume I. Clause 26.2 of Section VIII. SCC
"the applicable rate for liquidated damage is 0.5% of the contract price per week".
Considering the period(140days) to reach Liquidated damage limit, please amend rate for liquidated damage from 0.5% to 0.3%

Answer 9: Please follow the bidding document.

Query 10: Volume I. Clause 27.8 of Section 7. GCC
It is common practice to state the limitation on the extension of the Defects Notification Period in the relative Sub-Clause. We would like to propose that Defects Notification Period shall not be extended by more than 2 years.

Answer 10: Please follow the bidding document.

Query 11: Volume I. Clause 10.2 of Section VIII. SCC
In terms of installation of transmission line, it is fairly unreasonable for the Contractor to take all responsibility for acquiring legal and physical possession of the transmission line sites and access thereto.

- Please delete Sub-Clause 10.2 of SCC in its entirety and reinstate the original Sub-Clause 10.2 of GCC.
- Answer 11: Please follow the bidding document.
- Query 12: Volume I. Clause 10.3 of Section VIII. SCC
It is fairly unreasonable for the Contractor to obtain all permits, approvals and/or license which are even required by the Employer to obtain. Please delete of Sub-Clause 10.3 of SCC in its entirety and reinstate the original Sub-Clause 10.3 of GCC.
- Answer 12: Please follow the bidding document.
- Query 13: Volume I. Clause 12.3 of GCC / Appendix 1 to the Contract Agreement
In accordance with Sub-Clause 12.3 of GCC, the rate of interest on the amount of delayed payment will be shown in the Appendix 1 to the Contract Agreement. However, it is not shown in the Appendix 1. Please let us know interest rate for the delayed payment.
- Answer 13: No interest shall be applied. Hence, the rate is not mentioned.
- Query 14: Volume I. Clause 13 of Section 7. GCC
there is provision that Bid/ P-Bond should be issued in local bank, but AP-Bond no provision. Please clarify that AP-Bond should be issued in local bank or not.
- Answer 14: Advance Payment Guarantee must be issued from any Scheduled Bank located in Bangladesh.

Volume 2 of 3

- Query 1: Vol.2, Section XV, Annex 15-1; Aircraft Navigation

Type of obstruction lights is "Type C" as per Vol.2, Annex 15-1.
It comprise 2,000 candela lamp, fixed signal type, and so on.
Please confirm whether obstruction lights of "Type C" shall be supplied or not.
- Answer 1: The Above requirement has already been amended as per ICAO. Please refer to Addendum 1.
- Query 2: Manufacturer for Insulator

All types of insulators to be supplied under this contract shall be supplied from the same manufacturer as per Vol2, 9. Insulator, 9.1 Scope. Please confirm.
- Answer 2: Confirmed
- Query 3: Vol.2, Annex 16-1, Elcometer: Please provide detail model & type for Elcometer.
- Answer 3: Please contract with manufacturer.
- Query 4: Page11-16 & 11-17, Vol.2, Annex 11-1 : Conductor – Types & Uses
2. 400kV – River Crossing portion; Earthwire

Conductor	Phase	Earthwires	
Direction of external lay	Right hand	Right hand	Right hand
Cross Sectional Area of Al (mm ²)	724	-	-
Cross Sectional Area of Composite Core (mm ²)	71	-	-
No. of Composite Core (mm)	1	-	-
Shape of wires	All trapezoidal	Round	Round
Diameter of Composite Core (mm)	9.53	-	-
Rated tensile strength of core (kN)	184	-	-
Current carrying capacity at 180 Deg C	2096 [Refer Note (iii)]	-	-
Max. allowable emergency operating temp. (Deg C)	200	-	-
Maximum DC Resistance at 20 Deg C (ohm/km)	0.0387	-	0.323

It is mentioned that the DC Resistance at 20 Deg C of OPGW for 400kV River Crossing portion shall be 0.323 ohm/km.

But, most of OPGW manufacturer asked that the value shall be bigger than 0.4 ohm/km because the earthwire conductor (ACS 19x3.67) is over 0.4 ohm/km and OPGW shall also be equivalent with that.

Please clarify above question.

Answer 4: Please refer to Addendum 2.

Query 5: Page8-32 & 22-25, Vol.2; Annex 8-4 : Support Extension (1)

Annex 8-4: (1) Support Extensions

Tower Type	Type of Extension	Range (m)
400kV double circuit towers for Quad ACCC Dhaka		
4DL	Body/leg extension	Std., 1.5, 3.0, 4.5, 6.0, 9.0
4D1	Body/leg extension	Std., 1.5, 3.0, 4.5, 6.0, 9.0, 12.0, 15.0, 18.0, 21.0, 25.0, 30.0, 40.0

It is mentioned in above table that 4D1 type tower has Body/Leg extension 12.0, 15.0, 18.0, 21.0m. But in bid drawing and price schedule is saying that the Body/Leg extension is 12.0, 15.0, 20.0m.

Answer 5: Please refer to Addendum 2.

Query 6: Page8-16, Vol.2, 8.3.3 Bolts, Nuts, Clevis Pins and Washers

8.3.3 Bolts, Nuts, Clevis Pins and Washers

8.3.3.1. Unless specified to the contrary the following grades of steel shall be applicable:

- Material quality of bolts of 12 mm diameter shall be Grade 4.6 according to ISO 898
- Material quality of bolts and clevis pins of 16 mm diameter and over shall be Grade 5.6 according to ISO 898.
- Material quality of non-structural step bolts shall be Grade 6.9 according to ISO 898.
- Material quality of nuts shall be Grade 5 according to ISO 898 and appropriate to the material quality of bolts.

It is mentioned that the connection bolts shall be Grade 5.6 according to ISO code.

But, when considering the big loads and wind velocity(80 m/s) it is expected that there would be so plenty of bolts for some towers . In this case Grade 8.8 might also be considered for manufacturing and erection as practical method.
Please clarify above question.

Answer 6: Grade 8.8 connection bolts may also be considered acceptable.

Query 7: The Required insulator for 400kV transmission line consist of 210kN, 300kN and 400kN. So we need the detailed parameter table (list of parameters) and design pattern (drawing)

Besides, as per documents, it is mentioned 120kN insulator is used for 132kV transmission line. Please make it clear that what are the types to be used for this project. So please provide the parameter table (list of parameters) and design pattern (drawing).

Please provide the numbers (nos.) of pieces of insulator in each set (string) of each kind required for the lines. And the numbers (nos.) of each kind of insulator. With such we could make offer proper.

Answer 7: Please refer to Section-9 and Section-10, Vol. 2 of bidding document.

Query 8: As to Bangladesh 2.1 transmission line, the aviation obstructions beacons are required on the tower. So how many beacons are required?

Temporarily it is considered as 4 insulator AKA on 4 points located at earth wire and the upper wire. Is this right?

Answer 8: The Query is not understood. However, please follow Section 15, Vol. 2 of bidding document.

Query 9: Volume 2 – Scope of works Technical Specifications Drawing forming part of specification PGTL 400kV BoQ.
Annex 9-2: Electrical & Mechanical Characteristics; 2. 400kV Line (River Crossing Portion)
Schedule 1: A2.2 400kV River Crossing Portion

Annex 9-2: 2. 400kV Line (River Crossing Portion) shows respectively the suspension and electromechanical failing load are 2 x 210 and 2 x 400kN, but as shown in schedule 1, A2.2 300kN triple suspension Insulator set and 400kN triple tension insulator set shall be used.

Please clarify which is correct.

Answer 9: This matter has been cleared in Clarification-1. Please refer to the hard copy of bidding document.

Query 10: The wind speed given in the technical specification is 80m/sec which is 3-Sec gust wind speed. Since the technical specification had asked to calculate the loadings as per ASCE 74-2009 manual, if we consider this wind speed the wind pressure on conductor comes around 420kg/sq. m and the sag of the conductor comes in the range of 24m to 29m. As per the technical specification it has been indicated that the bottom most attachment height of conductor from ground level is 24.57m.

Kindly confirm whether the 3-sec gust wind 80m/sec has to be considered directly in the following equation which is as per ASCE 74-2009 manual or any reduction/correction factor needs to be applied to the wind speed for calculating the wind pressure on conductor and earthwire.

$$F/A = \gamma_w \cdot Q \cdot K_z \cdot K_{zt} \cdot (V_{50})^2 \cdot G_w \cdot C_f$$

Answer 10: Please follow the bidding document and relevant Addendum and Clarification.

Query 11: Kindly refer to volume 2 of 3 of Bid document Chapter 8 Annex 8-1 (2) Pg 8-29, Our Wind Pressure Calculations based on ASCE 74-2010 for a Wind speed of 80m/s at 3 sec gust yields a Value which is almost 2- 3 times the Wind Pressure of the Existing Lines in Bangladesh namely-

(a) 230kV Barisal – Bhola line having 56m/s average wind speed corresponding to an average period of 10 min, Wind Pressure on Conductor = 199.06 kg/m²

(b) 230kV Hathazari – Sikalbaha (JICA PKG-6) having 56m/s average wind speed corresponding to an average period of 10 min, Wind Pressure on Conductor = 199.06 Kg/m²

(c) 400kV DC Ashuganj – Bhulta line having 45m/s average wind speed corresponding to an average period of 10 min, Wind Pressure on Conductor = 120.06 Kg/m²
and

(d) 400kV DC Ghorasal – Tongi (IsDB Funded TL Project) having 47m/s average wind speed corresponding to an average period of 10 min, Wind Pressure on Conductor = 188 Kg/m².

As the wind pressure calculations as per ASCE standard on the given wind speed is abnormally high and have severe impact on the overall project components especially tower designs and associated foundation designs which in turn shall increase the project cost abnormally which may be significantly

higher than the budgeted cost estimates of PGCB for this project based on previous similar projects. However, as there is no previous relevant project reference with same wind speed is available the whole project cost estimation also needs a critical review in advance to avoid any future funding issues. In view of the above, it is very important that the above design parameters must be reviewed critically considering the similar terrain projects like Bhola Barisal etc. Submitted for your kind consideration please.

Answer 11: Please follow the bidding document.

Query 12: Kindly refer to volume 2 of 3 of the bidding document Chapter 8 "Annex 8-4 (2) Pg 8-33, Basic Dimension of Supports – Min height of standard tower up-to bottom conductor attachment is furnished as 24.57m for 4DL & 4D1, 24.5m for 4D25, 4D45 & 4DT60 towers. However, the Height based on Sag value calculated on the basis of ASCE 74-2010 considering wind speed of 80 m/s at 3sec gust works out to be 35 – 40 % Higher. Hence we feel that the Wind Speed 80 m/s at 3sec gust should be considerably reduced to a more realistic value which should be 56 m/sec for 3 sec gust in line with the wind speed of the Existing Lines in Bangladesh to achieve overall economy of the Line (tower + foundation cost) for both in-land and river crossing towers. Put up for your clarification please.

Answer 12: Please follow the bidding document.

Query 13: It is to submit that Wind speed of 80m/s at 3 sec gust is very much on higher side which will lead to Tower weight increase of 2 to 2.5 times over "Tower weights designed with average wind speed of 56m/s corresponding to an average period of 10 min.(Existing Lines in Bangladesh). We request to please review the design wind speed and change the same to more realistic/practical levels (e.g. 56 m/s as in Bhola Barisal Line) in order to economise the overall value of the project. Please clarify the same.

Answer 13: Please follow the bidding document.

Query 14: **Reinforcement-Bar requirements:**

As per the Clarification-1 reply for Volume 2 of 3 (Answer 42): "Epoxy Coating is not required on Reinforcement Steel."

While as per changes at Sr. No. 3 (ii) in Addendum-1 related to Section 7-Foundation: "The Contractors are encouraged to use epoxy coated bar."

Both above clarifications & amendments are contradictory. We understand that Epoxy Coating not required on any kind of Reinforcement Steel Bars in this project. Please, confirm.

Answer 14: Though Epoxy Coating is not required on Reinforcement Steel, the Contractors may use epoxy coated bar.

Query 15: **Conductor Types and Uses [Annex 11-1, Vol.-2]**

As per Point No. 6.iii.b of Addendum-1, Page 3 of 5; the following text is added in given note in Annexure 11-1, Vol.-2 for 400 kV Overland portion and River crossing

"(iv) Absorptivity 0.9 and Emissivity 0.7"

In this regard, as per comment received from various conductor manufacturers, "to achieve emissivity 0.7, conductor need to be dull finish. This can be done by Grit blasting of conductor which is very special manufacturing process and expensive."

Accordingly, conductor needs to be grit blasted?? Please confirm.

Answer 15: Please follow the Specification and Addendum 1

- Query 16: Volume II. Annex 8-1 : Design Parameters and Conductor System Loading, Table-3 Conductor System Loading, (page 8-29)
Which of the following is a wind condition of Normal Condition (Damage Limit)? Please clarify.
a. "50% of failure limit"
b. "100% of failure limit".
- Answer 16: Please refer to clause 8.2.4, Vol. 2 of bidding document and relevant addendum (if any).
- Query 17: Volume II. Drawing no. PGCB/400kV/QF/4D1 (page 22-25) & Annex 8-4 (2)
The minimum height of standard tower is 24.57meters. It is included insulator length or not, please clarify.
- Answer 17: Your understanding is not correct. This is the minimum height of standard tower bottom conductor attachment point.
- Query 18: Volume II. Drawing no. PGCB/400kV/QF/4D25, 4D45, 4DT6 & 4DX (page 22-26, 22-28, 22-29 & 22-32)
The distance from an edge of cross arm to an insulator attachment point (=1450mm) is shown on above all angle tower drawings. Instead of 1450mm, could we suggest the calculated distance value, for angle towers, based on our tension insulator length and line angle?
- Answer 18: Please follow the bidding document.
- Query 19: Volume II. Clause 7.1.2 : Method Statement (page 7-1)
Please clarify that 10 method statement (e ~ n) details listed in clause.7.1.2 shall be submitted at the stage of technical bid or after award contract
- Answer 19: Method statement (e ~ n) details listed in clause.7.1.2 shall be submitted with bid proposal and during execution stage.
- Query 20: Volume II. Clause 7.2.7.4.1 : Rigid Frame Foundation (page 7-5)
An example of rigid frame foundation drawing is also missing in this new Tender Document. Please provide.
- Answer 20: Bidders/Contractors shall prepare the foundation drawing during execution.
- Query 21: Volume II. Clause 7.2.7.4.3 : Rigid Frame Foundation (page 7-5) & Clause 23.1 : Line Route Data (page 23-47 ~)
As per clause 7.2.7.4.3 & 23.1, we understand that an actual highest flood level and area is not provided in this tender document.(H.F.L in Cl.23-1 is for tower clearance) Therefore, the contractor shall select the tower location for rigid frame foundation as per own criteria and references.
Please clarify on whether our understanding is correct or not. And please provide us with the criteria of high water level area.
- Answer 21: Highest flood level is given in Survey data. However, Rigid frame foundation will not be required.
- Query 22: Volume II. Clause 7.4.5 e) : Epoxy Coated Bars (page 7-14)
We understand that an epoxy coated rebar is not required for all tower locations. Please clarify the criteria and requirement for use of epoxy coated rebar.
- Answer 22: Please refer to Clarification 1 and this clarification.
- Query 23: Volume II. Clause 7.4.22 : Site Protection (page 7-19)
Please clarify the criteria and requirement for installation of Crash Barrier.
- Answer 23: The bidder/contractor shall design the barrier during execution stage.

- Query 24: Volume II. Clause 7.2.7.2.4 b) & Annex 7-5
Please clarify as follows;
a. The safety factor for dead load(=weight of overburden soil, pile cap and piles) is 1.5.
b. The overload factor for foundation reaction is 1.35
And please clarify the overload factor for structural design.
- Answer 24: a) Your understanding is not correct. Please refer to Annex 7-1 in this regard.
b) 1.35 shall be considered for 400kV towers. For 132kV towers, the reaction is mentioned in Annex 8-13
- Query 25: Volume II. Clause 8.2.5.1.1 c)
Please clarify whether for suspension towers 3% and for angle towers 10% of conductor or earthwire/OPGW ultimate tensile strength is correct or it shall be replaced with maximum working tension strength
- Answer 25: Please follow the bidding document.
- Query 26: Volume II. Clause 8.2.8.a
only S355JR for high steel tensile steel is specified as per clause 8.3.1.b However, Grade S355JO is mentioned in clause 8.2.8.a and 8.4.4.1. Please clarify which one is correct.
- Answer 26: Please refer to Addendum 1 and Clarification 1
- Query 27: Volume II. Clause 7.3.12 and 7.5.6 are missing
Please provide technical specification of earthing material
- Answer 27: Please refer to Clause 7.4.23 and relevant drawing.

Enclosure: As stated.

The above mentioned clarifications will form part of the bidding documents.



List of 400kV PGTL Project Bid Document Purchaser Firms:

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POWER GRID COMPANY OF BANGLADESH LIMITED (PGCB)

**DESIGN, SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF PATUAKHALI (PAYRA)
- GOPALGANJ 400KV TRANSMISSION LINE ON TURNKEY BASIS**

IFB No.: 01/PGCB/Sec(TLD&QC)/4867 dated: September 01, 2016
Contract No: PGCB/400kV/PAT-GOP/TL

ADDENDUM NO. 2

Following revisions/changes are made in the Bidding Document which will form part of the Bidding Document:

Volume 1 of 3

1. Sl. No. 2, Vol. 1 of 3 of Addendum-1, Enlosure-1: Appendix 2 – Price Adjustment / Escalation; Conductors (ACCC), Page IX-10-(rev.1).

The text "The formula for calculating the price adjustment of the contract price component of the conductor (ACSR) & OPGW" is replaced by "The formula for calculating the price adjustment of the contract price component of the conductor (ACCC)"

Volume 2 of 3

1. Section 8 – Tower

- (i) Annex 8- 4: (1) Support Extensions, 400kV double circuit towers for Quad ACCC Dhaka, Page No. -8-32:-

Range (m) of Body/Leg Extension for 4D1 Type Tower, the text "18, 21" is replaced by "20.0"

2. Section 10 – Insulator and Conductor Fittings

- (i) Annex 10-3: Conductor Joints & Clamp- Type & Uses, Table 1. 400kV-Overland Portion and Table 2. 400kV – River Crossing Portion

The text "Preformed type required for heavy suspension sets. Not required for other sets" is replaced by "Preformed type required for all suspension sets".

3. Section 11 – Conductor

- (i) Annex 11-1: Conductor – Types & Uses 2. 400kV – River Crossing Portion; Page -11-17-

The text "0.323" is replaced by "0.4"

- (ii) Annex 11-4: Test Procedures of Conductor; 1.5 High Temperature Endurance and Creep Test, Section (ii), Page -11-22-

Following text is deleted.



"After completion of the above, the core of the conductor sample shall be subjected to UTS test as mentioned above at clause 1.1. The conductor core shall withstand a load equivalent to 95 % of UTS. In case of carbon fibre composites, the flexural strength should not be less than 90% of the value guaranteed in GTP and & the Glass Transition temperature shall not be less than 90% of the value guaranteed in GTP after thermal cycling. Flexural strength shall be obtained on the basis of test procedure indicated at 1.32 below. The supplier shall plot the thermal elongation with temperature."

- (iii) Annex 11-4: Test Procedures of Conductor, 1.11 Temperature Cycle Test, Page -11-23- and -11-24-

Following text is deleted

"In case of polymer composites, the flexural strength should not degrade by more than 10 % and the Glass Transition temperature shall not degrade by more than 10 % after thermal cycling. Flexural strength shall be obtained on the basis of test procedure indicated at 1.32 below."

- (iv) Clause No. 11.7.12- Manufacturing tolerance, Page no. -11-14-

The text "Manufacturing tolerances on the dimensions to the extent of $\pm 0.5\%$ percent shall be permitted for individual strands and the complete conductor." is replaced by following texts.

"a) ACSR

Manufacturing tolerances on the dimensions to the extent of $\pm 0.5\%$ percent shall be permitted for individual strands and the complete conductor.

b) ACCC

For Composite core as per ASTM B987, section 12 (Dimensions and Permissible Variation), the average diameter shall not differ by more than ± 0.05 mm from the nominal diameter of the composite core.

For Conductor as per ASTM B857, section 13 (Variation in area and diameter) The area of cross section of the aluminum wires of a conductor shall be not less than 98 % nor more than 102 % of the area specified and The diameter of the finished conductor shall be not less than 99 % nor more than 101 % of the diameter specified."

- (v) Clause 11.7.6 – Acceptance Test, Page no. -11-12- and -11-13-

"(xii) Bending Test on composite core: As per Annex.11-4" is added at the end of list of Acceptance Test.

The following notes is added after list of acceptance test

"All the tests to be performed on composite core shall be carried out in as manufactured conditions before dispatch of composite core. Two Engineers of PGCB will carry out the witnessing of these tests on 5% reels of each lot / shipment. Bidders are requested to refer to Clause 18.1.11.1 in this regard. All costs of such tests and witness shall deem to be included in the Contract Price"

