ASSAM ELECTRICITY GRID CORPORATION LIMITED
Regd. Off.: BIJULEE BHAWAN (FIRST FLOOR) PALTANBAZAR; GUWAHATI - 781001
CIN: U40101AS2003SGC007238 GSTIN: 18AAFCA4973J9Z3
PHONE: 0361-2739520 Web: www.aegcl.co.in

Corrigendum-I

BID IDENTIFICATION NO: AEGCL/MD/Tech-338/O&M(LAR)/2024/height Raising/Lalganesh Flyover /Bid

With reference to the above bid document for the work namely "Height Raising of 132kV Kahilipara-Kamakhya-AIIMS Transmission Line at Barshapara flyover crossing under Deposit work on Turnkey Basis" against Bid Identification No. mentioned above, the following may be noted: -

- The monopoles to be used for this project shall be of 'D-type' design. All engineering and fabrication activities must adhere to this specification.
- The previously uploaded HTLS conductor specifications are hereby superseded. The amended HTLS specifications have been attached with this communication for immediate reference and implementation.
- The route diagram, tower schedule and profile drawing are attached herewith for reference only.
- All monopole tower designs must be engineered to withstand Wind Zone 5 loading conditions. This requirement is mandatory for structural calculations and safety compliance.

All other terms and conditions of the bidding document remain same.

Chief General Manager (O&M), LAR
Assam Electricity Grid Corporation Ltd
Bijulee Bhawan, Paltanbazar, Guwahati – 01

Memo No. – AEGCL/MD/Tech-338/O&M(LAR)/2024/height Raising/Lalganesh Flyover/8 Dtd:24.07.25
Copy to:

1. The DGM-IT, O/o the MD, AEGCL, for publication of the corrigendum notice in AEGCL website. (Soft copy enclosed)
2. Ref. file.

Chief General Manager (O&M), LAR
Assam Electricity Grid Corporation Ltd
Bijulee Bhawan, Paltanbazar, Guwahati – 1

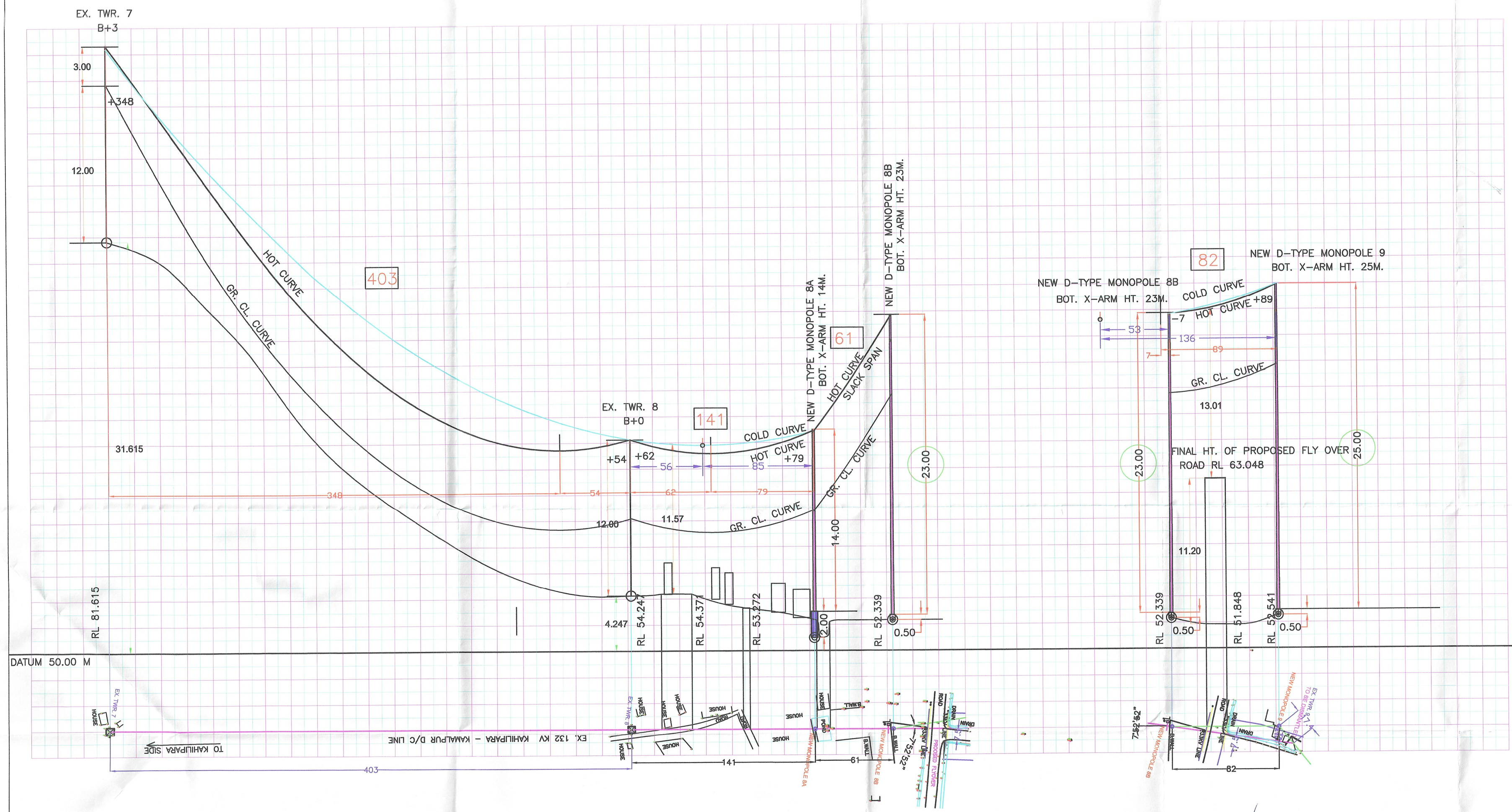
Checked By AM (P&D)	Checked By DM (P&D)	Checked By AGM (P&D)	Checked By DGM (P&D)	Approved By GM (P&D)

*Approved from Ext-8.

APPROVED, subject to the condition that the approval conveyed herein neither relieves the contractor of his contractual obligations and his responsibilities, design details, performance particulars and conformity of the supplies with the Indian Statutory laws / IEC specifications as may be applicable, nor does limit the AEGCL's right under the contract.

*Slack span at reduced tension of 418.6 kg at 32°C w/w condition shall be provided in the span between New Monopole 8A and New monopole 8B.

FOR REFERENCE ONLY



NEW TOWER TYPE (NEW CONCEPT):
'A' TYPE 0-2 degree
'B' TYPE 2-15 degree
'C' TYPE 15-30 degree
'D' TYPE 30-60 degree

EX. TOWER TYPE (OLD CONCEPT):
'A' TYPE 0-2 degree
'B' TYPE 2-30 degree
'C' TYPE 30-60 degree

ALL DIMENSIONS ARE IN METER
HORIZONTAL 1CM = 20 M
VERTICAL 1CM = 2 M

FIRST SUBMISSION	Prep.	Chkd.	Appd.		
DESCRIPTION	SIGN			DATE	

PROJECT :	HEIGHT RAISING BETWEEN TOWER NO. 8 & 9 OF 132 KV D/C KAHILIPARA KAMAKHY/KAMALPUR/RANGIA LINE FOR THE PROPOSED CYCLE FACTORY TO LAL GANESH FLYOVER AT BARSAPARA STADIUM POINT
TITLE :	PLAN & PROFILE DRAWING
OWNER :	ASSAM ELECTRICITY GRID CORPORATION LIMITED (A.E.G.C.L)
DRG. NO. :	HDEC/AEGCL/CYCLE FACTORY FLYOVER/TWR 7–11/P&P/01
PREPARED & SUBMITTED BY :	HI-TECH DESIGN ENGG. & CONS. SILPUKHURI, GUWAHATI-3, PH: 94354 00185
DATE : 07.11.2024	REV. 0

NOTE :
THERE IS NO SPACE TO MAKE ANY TOWER NEAR REPLACING EX. TWR 8. NO PLACE FOR MONOPOLE AND ALSO CAN'T PLACE MONOPOLE AS CRANE CAN'T GO.

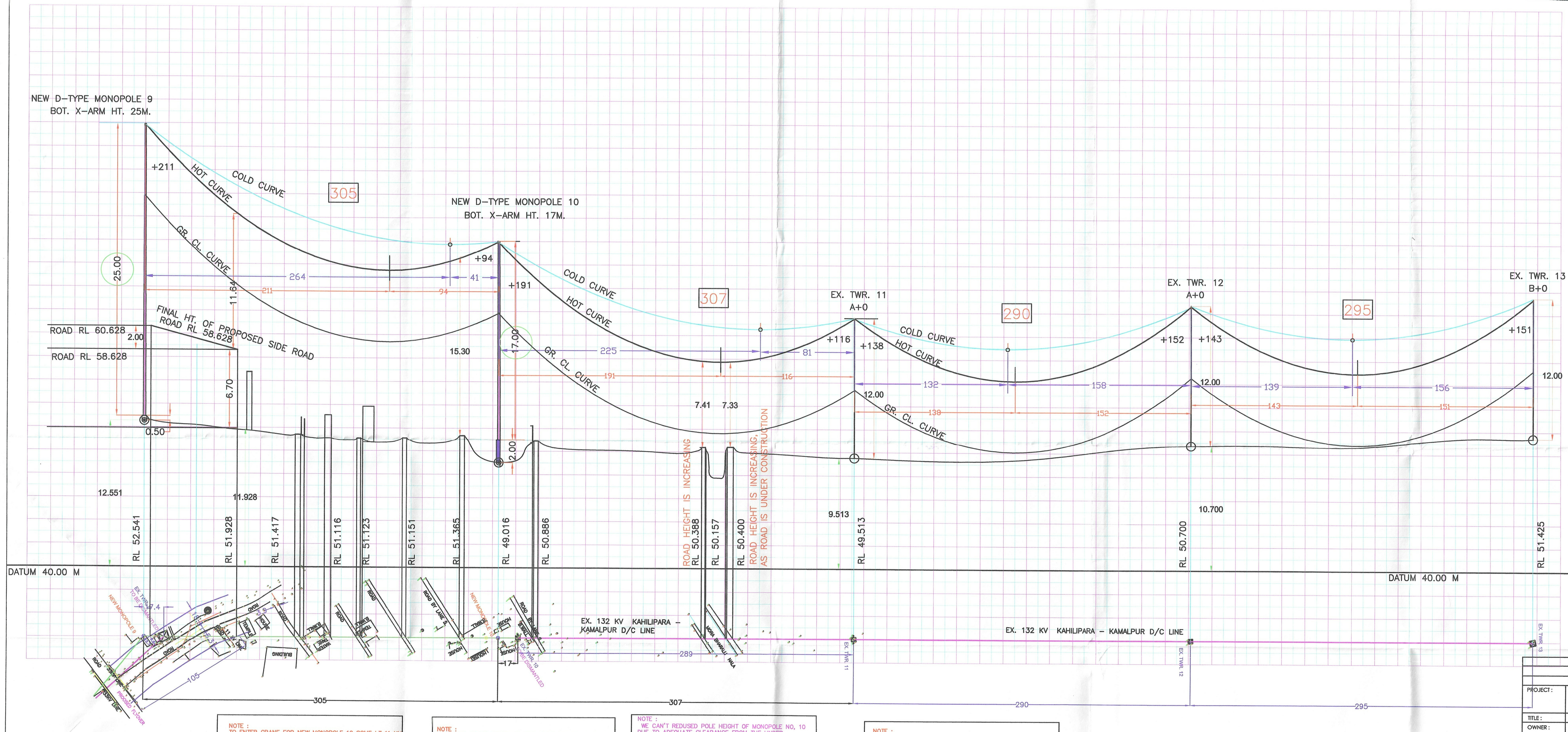
SHEET 1 OF 2

Chief Manager (P&P)
132 KV Incoming Line Maintenance
Sub-Division, AEGCL
Kahilipara, GHY-19

Asstt. General Manager
132 KV EHV Grid Sub-Station
AEGCL, Kahilipara Guwahati-19

Deputy Manager
132 KV Incoming Line Maintenance
Sub-Division, AEGCL
Kahilipara, Guwahati-19

HI-TECH DESIGN ENGG. & CONS. GHY-3 PHONE- 9435400185



NOTE :
TO ENTER CRANE FOR NEW MONOPOLE 10 SOME LT 11 KV CABLE TO BE RAISED.

NOTE :
LOW LAND TO BE FILLED UP WITH GOOD QUALITY MARL TO TAKE THE CRANE TO ERECT MONOPOLE NO. 10.

NOTE :
WE CAN'T REDUSED POLE HEIGHT OF MONOPOLE NO. 10 DUE TO ADEQUATE CLEARANCE FROM THE UNDER CONSTRUCTION ROAD NEAR MORA BHARALI NALA. CONDUCTOR FINALLY MAY BE LOOSE THAN IT IS SHOWN IN PROFILE.

NOTE :
THERE IS NO SPACE TO MAKE ANY TOWER NEAR REPLACING EX. TWR 11. NO PLACE FOR MONOPOLE AND ALSO CAN'T PLACE MONOPOLE AS CRANE CAN'T GO.

Checked By AM (P&D)	Checked By DM (P&D)	Checked By AGM (P&D)	Checked By DGM (P &D)	Appro. GM.

APPROVED, subject to the condition that the approval conveyed herein neither relieves the contractor of his contract obligations and his responsibilities, design det. performance particulars and conformity of supplies with the Indian Statutory laws / Is specifications as may be applicable, nor does it the AEGCL's right under the contract

*Approved to EXT-11.

FOR REFERENCE ONLY

NEW TOWER TYPE (NEW CONCEPT):
A: TYPE 0-2 degree
B: TYPE 2-15 degree
C: TYPE 15-30 degree
D: TYPE 30-60 degree

EX. TOWER TYPE (OLD CONCEPT):
A: TYPE 0-2 degree
B: TYPE 2-30 degree
C: TYPE 30-60 degree

ALL DIMENSIONS ARE IN METER
HORIZONTAL 1CM = 20 M
VERTICAL 1CM = 2 M

	FIRST SUBMISSION	Prep.	Chkd.	Appd.
	DESCRIPTION	SIGN		DATE
PROJECT :	HEIGHT RAISING BETWEEN TOWER NO. 8 & 9 OF 132 KV D/C KAHILIPARA KAMAKHY/KAMALPUR/RANGIA LINE FOR THE PROPOSED CYCLE FACTORY TO LAL GANESH FLYOVER AT BARSAPARA STADIUM POINT			
TITLE :	PLAN & PROFILE DRAWING			
OWNER :	ASSAM ELECTRICITY GRID CORPORATION LIMITED (A.E.G.C.L)			
ORG. NO. :	HDEC/AEGCL/CYCLE FACTORY FLYOVER/TWR 7-11/P&P/01			
PREPARED & SUBMITTED BY :	HI-TECH DESIGN ENGG. & CONS. SILPUKHURI, GUWAHATI-3, PH: 94354 00185			
DATE : 07. 11. 2024	REV. 0			

SHEET 2 OF 2

Manager
132 KV Incoming Line Maintenance
Sub Division, AEGCL
Kahilipara, Guwahati-19

Deputy Manager
132 KV Incoming Line Maintenance
Sub-Division, AEGCL
Kahilipara, Guwahati-19

HI-TECH DESIGN ENGG. & CONS. Phone: 9435400185

Checked By AM (P&D)	Checked By DM (P&D)	Checked By AGM (P&D)	Checked By DGM (P&D)	Approved By GM (P&D)

N

APPROVED, subject to the condition that the approval conveyed herein neither relieves the contractor of his contractual obligations and his responsibilities, design data, performance particulars and conformity of the supplies with the Indian Statutory laws and specifications as may be applicable, nor does it limit the AEGCL's right under the contract.

* Approved from Ext-8 to Ext-11.

FOR REFERENCE ONLY

TO KAMAKHYA SIDE

EX. TWR. 10

MORA BHARALU NALA

ROAD

307

THIS SIDE CKT WITH PANTHER CONDUCTOR

EX. 132 KV KAHILIPARA – KAMALPUR D/C LINE

289

THIS SIDE CKT WITH HTLS CONDUCTOR

EX. TWR. 9 TO BE DISMANTLED

NEW MONOPOLE #A RAISED FDN. 2.0 M

ROAD BY LANE 6

B.WALL

HOUSE

NEW MONOPOLE #B

PROPOSED FLYOVER

ROAD BY LANE 5

ROAD BY LANE 4

ROAD BY LANE 3

ROAD BY LANE 2

TEMPLE

WATER TANK

BUILDING

305

UTM COORDINATE OF LS MATCHED WITH PWD LEVEL 52.0464M.

DRAIN

BRIDGE

3.5

105

99

18

50°54'29"

82

61

POND

BUND

141

403

EX. TWR. 7

TO KAHILIPARA SIDE

SCALE : 1 CM = 15 M

ALL DIMENSIONS ARE IN METEER

NEW TOWER TYPE (NEW CONCEPT):

'A' TYPE 0-2 degree
'B' TYPE 2-15 degree
'C' TYPE 15-30 degree
'D' TYPE 30-60 degree

EX. TOWER TYPE (OLD CONCEPT):

'A' TYPE 0-2 degree
'B' TYPE 2-30 degree
'C' TYPE 30-60 degree

REV.	DESCRIPTION	Prep.	Chkd.	Appd.	DATE
		SIGN			
0	FIRST SUBMISSION	HDEC			

ASSAM ELECTRICITY GRID CORP. LTD.
BIJULI BHAWAN, GUWAHATI, ASSAM

PROJECT :	HEIGHT RAISING BETWEEN TOWER NO. 8 & 9 OF 132 KV D/C KAHILIPARA KAMAKHY/KAMALPUR/RANGIA LINE FOR THE PROPOSED CYCLE FACTORY TO LAL GANESH FLYOVER AT BARSAPARA STADIUM POINT
TITLE :	ROUTE MAP
OWNER :	ASSAM ELECTRICITY GRID CORP. LTD
DRG. NO. :	HDEC/AEGCL/CYCLE FACTORY FLYOVER/TWR 7–11/PLAN/01
PREPARED BY :	HI-TECH DESIGN ENGG. & CONS. SILPUKHURI, GUWAHATI-3, PH: 94354 00185
CHECKED BY :	
DATE :	07. 11. 2024
REV.	0

Deputy General Manager
Lower Assam T&T Circle
AEGCL, Narengi, Guwahati- 26

Deputy Manager
132 KV Incoming Line Maintenance
Sub-Division, AEGCL
Kahilipara, GHY-19

Assistant General Manager
132 KV EHV Grid Sub-Station
AEGCL, Kahilipara Guwahati-19

Deputy Manager
132 KV Incoming Line Maintenance
Sub-Division, AEGCL
Kahilipara, Guwahati-19

HI-TECH DESIGN ENGG. & CONS. GHY-3 Phone- 9435400185

* Slack span at reduced tension of 418.6 kg at 32°C/W condition shall be provided in the span between New monopole – 8A and New monopole 8B.

APPROVED, subject to the condition that the approval conveyed herein neither relieves the contractor of his contractual obligations and his responsibilities, design details, particulars and conformity of the supplies with the Indian Statutory laws / IE [illegible]

TOWER SCHEDULE

RAISING OF TOWER OF EXISTING 132 KV D/C KAHILIPARA/KAMAKHYA/KAMALPUR/RANGIA LINE BETWEEN TWR. NO 8 & 9 THE PROPOSED CYCLE FACTORY TO LALGANESH FLYOVER AT BARSAPARA STADIUM POINT

* Approved from Ext-8 to Ext-11.

SL.NO	TOWER	SPAN (M)	TYPE OF TOWER	ANGLE OF DEVIATION	WEIGHT SPAN (M) LEFT	RIGHT	TOTAL	WIND SPAN (M)	CROSSING	GPS COORDINATE	REMARKS
1	EX. TWR 7		B+3	00°00'00"							
2	EX. TWR 8		B+0	00°00'00"		62					
		141							ROAD		
3	NEW MONOPOLE NO.8A D/C BOTTOM X-ARM HT 14M		D TYPE	00°00'00"	79			101		N 26°08'49.6", E 91°44'30.0"	2.0 M. RAISED FDN. IN POND
	Slack Span.	61							POND		
4	NEW MONOPOLE NO.8B D/C BOTTOM X-ARM HT 23M		D TYPE	07°52'52" LT		-7		71.5		N 26°08'49.7", E 91°44'27.9"	0.5 M. RAISED FDN.
		82							PROPOSED FLYOVER, DRAIN		
5	NEW MONOPOLE NO.9 D/C BOTTOM X-ARM HT 25M		D TYPE	50°54'29"RT	89	211	300	193.5		N 26°08'49.3", E 91°44'25.0"	0.5 M. RAISED FDN.
		305							ROAD, WALL		

Checked By AM (P&D)	Checked By DM (P&D)	Checked By AGM (P&D)	Checked By DGM (P&D)	Approved by GM (P&D)

FOR REFERENCE ONLY

Junior Manager 8/11/24
132 KV Incoming Line Maintenance Sub Division, AEGCL Kahilipara, Ghy-19

Asstt. General Manager 8/11/24
132 KV EHV Grid Sub-Station Kahilipara Guwahati-19

Deputy Manager 8/11/24
132 KV Incoming Line Maintenance Sub-Division, AEGCL Kahilipara, Guwahati-19

Deputy General Manager (Civil)
AEGCL, Bijulee Bhawan
Paltanbazar, Guwahati-1

TOWER SCHEDULE

RAISING OF TOWER OF EXISTING 132 KV D/C KAHILIPARA/KAMAKHYA/KAMALPUR/RANGIA LINE BETWEEN TWR. NO 8 & 9 THE PROPOSED CYCLE FACTORY TO LALGANESH FLYOVER AT BARSAPARA STADIUM POINT

SL.NO	TOWER	SPAN (M)	TYPE OF TOWER	ANGLE OF DEVIATION	WEIGHT SPAN (M) LEFT	RIGHT	TOTAL	WIND SPAN (M)	CROSSING	GPS COORDINATE	REMARKS
6	NEW MONOPOLE NO.10 D/C BOTTOM X-ARM HT 17M		D TYPE	00°00'00"	94	191	285	306		N 26°08'56.3" E 91°44'17.1"	2.0 M. RAISED FDN.
		307							ROAD		
7	EX. TWR 11		A+0		116						
	TOTAL	896									

Checked By AM (P&D)	Checked By DM (P&D)	Checked By AGM (P&D)	Checked By DGM (P&D)	Approved By GM (P&D)

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SUMMARY OF TOWERS

EXISTING TOWER TYPE (OLD CONCEPT) :

A TYPE 0° - 2°
B TYPE 2°-30°
C TYPE 30°-60°

NEW MONOPOLE TYPE (NEW CONCEPT) :

D TYPE 30° - 60°

QTY. OF MONOPOLES :

D+14	1 MONOPOLES D/C BOTTOM X-ARM HT14 M
D+ 17	1 MONOPOLES D/C BOTTOM X-ARM HT 17M
D+23	1 MONOPOLES D/C BOTTOM X-ARM HT 23M
D+25	1 MONOPOLES D/C BOTTOM X-ARM HT 25M
TOTAL	4

PREPARED BY :
HI-TECH DESIGN ENGINEERING & CONSTRUCTIONS
Dated 07-11-2024

Deputy General Manager (Civil)
AEGCL, Bijulee Bhawan
Paltanbazar, Guwahati-1

Junior Manager
132 KV Incoming Line Maintenance Division, AEGCL

Deputy General Manager
132 KV EHV Grid Sub-Station
AEGCL, Kahilipara Guwahati-19

Deputy Manager
132 KV Incoming Line Maintenance
Sub-Division, AEGCL
Kahilipara, Guwahati-19

SECTION-14
TECHNICAL SPECIFICATION OF HTLS CONDUCTOR

TECHNICAL SPECIFICATIONS OF HTLS CONDUCTOR

14.1 GENERAL REQUIREMENTS

14.1.1 The offered HTLS Conductor shall be Panther equivalent HTLS conductor and shall be capable of providing minimum 600 A capacity and shall conform to latest CEA "Guidelines for Rationalized use of high performance conductors" at a continuous operating conductor temperature higher than that of not exceeding the maximum permissible operating temperature for continuous operation of the offered HTLS Conductor and without exceeding the level of maximum permissible sag as prescribe in clause no 14.1.6. and 14.2.

The physical and operating performance requirements of the transmission line with HTLS conductor are mentioned below. The bidder shall offer HTLS conductor complying with the specified requirements. The Bidder shall indicate particulars of the proposed conductor in the relevant GTP schedule of BDS along with calculations to establish compliance with the specified requirements.

14.1.2 The calculations for Ampacity shall be based on IEEE Standard 738. The bidder in his bid shall furnish calculations for the ampacity based on the above Standard for the proposed HTLS conductor.

14.1.3 The design of conductor shall be suitable for operation at a steady state conductor temperature experienced for AC current flow of rated ampacity 600A (132kV) Amperes under the above ambient conditions based on ampacity calculations mentioned above. The bidder shall also indicate the maximum permissible conductor temperature for continuous operation without any deterioration of its electrical, mechanical & metallurgical properties. The bidder shall also furnish the maximum permissible conductor temperature for short-term operations including permissible duration of such short-term operation.

14.1.4 Each conductor / sub conductor in the bundle of HTLS conductor shall be suitable to carry minimum specified 50 Hz alternating current of 600A (132kV) of 50 Hz alternating current under the ambient conditions & maximum conductor sag specified below while satisfying other specified technical requirements/ parameters as mentioned in the Service condition above.

14.1.5 Maximum permissible conductor sag for 320 (132kV ACSR Panther) and 350 m (220kV ASCR Zebra) span conductor at 85 degC operating temperature and nil wind corresponding to 50 Hz and at maximum alternating current 437 (132kV) amp and 900 (220kV) amp per conductor under ambient conditions specified above = 7.224m (132kV) and 8.435m (220kV). In case of HTLS conductor, the maximum sag for permissible conductor temperature and nil wind for continuous operation shall not be considered more than 7.224m (132kV) and 8.435m (220kV). The bidder shall also furnish the maximum permissible conductor temperature for short term operations including permissible duration of such short-term operation (Not required for bus).

Technical Particulars of HTLS Conductor

The HTLS conductor shall meet the following minimum requirements:

Overall diameter of complete conductor	Not exceeding 21.00mm (132kV) & 28.62 mm (220kV)
Approx. mass of complete conductor (kg/km)	Less than or equal to 974kg/kM (132kV) & 1621 kg/km (220kV)
Direction of lay of outer layer	Right Hand

14.1.6 The bidder shall indicate the technical particulars and details of the construction of the conductor in the relevant schedule of GTP. The bidder shall also guarantee the DC resistance of conductor at 20 deg C and AC resistance at the calculated temperature corresponding to 50Hz alternating current flow of 600 amperes at specified ambient conditions (maximum continuous operating temperature).

The bidder shall submit the supporting calculations for the AC resistance at 600 A indicating details & justifications of values of temperature coefficient of resistance & DC to AC resistance conversion factor(s) with due reference to construction / geometry of the conductor.

Note: In case of any discrepancy, CEA guidelines for Rationalised use of High-Performance conductors shall govern.

14.2 Sag-Tension Requirements (Not required for bus)

14.2.1 The HTLS conductor shall meet the following sag tension requirements for ruling span of 325m (132kV) and 350 meters (220kV)

Particulars	Limiting value
Tension at every day condition (32°C, no wind)	Not exceeding 25% of UTS of proposed conductor
Sag at maximum continuous operating temp	≤ 7.24 m (132kV) & 8.435 meters (220kV)
i) Tension at 32 deg C, full wind (52 kg/m2)	not exceeding 70% of UTS of proposed conductor

14.2.2 Survey & profiling of existing line route using Total stations, verification of availability of statutory electrical clearances using PLS-CADD software.

Sag-Tension calculations at various conditions mentioned above using parabolic equations shall be submitted along with the bid. These calculations shall also include calculations for determination of transition/knee point temperature. The bidder must use PLS-CADD software for sag tension calculations.

14.2.3 The bidder shall also furnish sag & tensions under no wind for various temperatures starting from 0 deg C to maximum continuous operating temperature in steps of 5 deg C.

14.2.4 After award of the contract, the Supplier shall submit Sag-Tension calculations corresponding to various conditions given above for all the existing spans and spans ranging from 50 m to 350 m in intervals of 50 m.

Besides above, the Supplier shall also furnish details of creep characteristics in respect of HTLS conductor based on laboratory investigations/ experimentation (creep test as per IEE1138) conducted on similar type of conductor and shall indicate creep strain values corresponding to 1 month, 6 month, 1 year & 10 year creep at everyday tension & at maximum continuous operating temperature.

14.3 Ohmic Loss and Liquidated damage for excessive losses: -

Average ohmic losses (kW)= Loss load factor X Line length X no. of sub conductors X (continuous operating current)^2

X AC resistance per km guaranteed by the bidder at temperature corresponding to continuous operating current under normal condition.

On testing, if it is found that actual losses are more than the values, quoted in the bid, undisputed liquidated damages shall be recovered from the supplier at the following rates.

For each KW of excess loss Rs.3, 30,220.00/ KW.

For fractional Kilowatt, penalties shall be applied on pro-rata basis. No bonus shall be payable for loss, which are less than those, stated in the GTP.

14.4 Workmanship:

All the conductor strands shall be smooth, uniform and free from all imperfections, such as spills and splits, cracks, die marks, scratches, abrasions, rust etc.

The finished conductor shall be smooth, compact, uniform and free from all imperfections including kinks (protrusion of wires), wire cross over, over riding, looseness (wire being dislocated by finger/hand pressure and/or unusual bangle noise on tapping), material inclusions, white rust, powder formation or black spot (on account of reaction with trapped rain water etc.), dirt, gritetc.

14.5 Joints in Wires

14.5.1 Aluminum OR Aluminum Alloy Wires

During stranding no Aluminum/ aluminum Alloy welds shall be made for the purpose of achieving the required conductor length.

14.5.2 No joints shall be permitted in the individual wires in the outer most layer of the finished conductor. However, joints are permitted in the inner layer(s) of the conductor unavoidably broken during stranding provided such breaks are not associated with either inherently defective wire or with the use of short lengths of Aluminium Alloy wires. Such joints shall not be more than four (4) per conductor length and shall not be closer than 15 meters from joint in the same wire or in any other Aluminium Alloy wire of the completed conductor. A record of such joints for each individual length of the conductor shall be maintained by The Contractor for Owners review.

14.5.3 Joints shall be made by cold pressure butt welding and shall withstand a stress of not less than the breaking strength of individual strand guaranteed.

14.5.4 Composite Carbon Core

There shall be no joint of any kind in the finished core entering into the manufacture of the strand. There shall also be no joints or splices in any length of the completed stranded core.

14.5.5 Tolerances

Manufacturing tolerances on the dimensions to the extent of one percent (±1%) shall be permitted for individual strands and the complete conductor.

14.6Materials

The materials used for construction of the conductor shall be such that the conductor meets the specified technical and performance requirements.

14.6.1 Outer layer

The material of outer layer HTLS conductor shall be of fully annealed aluminium (0 tempered) having purity not less than 99.5% and a copper content not exceeding 0.04%. The strands shall be manufactured through appropriate manufacturing process to ensure consistent electrical, mechanical and metallurgical properties under continuous high temperature operation. Bidder shall guarantee the chemical composition in the schedule GTP of

BDS and also furnish description of the manufacturing process in the Bid.

In case of fully annealed type (0 tempered) aluminium strands trapezoidal/Z-shaped wire shall only be accepted.

14.6.2 Non-Metallic Solid Core

Core of offered HTLS conductor shall be as per CEA guidelines for rationalized use of High-performance conductors.

Hybrid carbon and glass fiber composite core which utilizes a high-temperature epoxy resin matrix to bind hundreds of thousands of individual fibers into a unified load-bearing tensile member will be acceptable. The central carbon fiber core shall be surrounded by high-grade boron-free glass fibers to improve flexibility and toughness while preventing galvanic corrosion between the carbon fibers and the aluminum strands. Stranded core design is also acceptable subject to fulfillment to all the type test reports.

Bidder shall furnish properties and composition of the core in the GTP schedule. The composite material for core shall be of such proven quality that its properties are not deteriorated by the normal operating conditions of 132KV transmission line in tropical environment conditions as experienced by the existing lines. The Bidder shall provide adequate details including specifications, Design Validation test reports as per ASTM B987 and performance certificates etc. in support of the suitability of the offered materials. Care to be taken for internal friction due to different material having different thermal co efficient of expansion.

14.7 Standard conductor Length

After survey of the involved section of the line by tower contractor, the supplier shall determine the most appropriate individual conductor lengths to be manufactured and supplied keeping in view tower schedules, section lengths, special crossings etc. and the drum schedules shall be submitted to the owner for review and approval.

The standard length of the conductor shall be indicated by the bidder in the guaranteed technical particulars of offer. A tolerance of +/-5% on the standard length offered by the Bidder shall be permitted. However, during execution cut lengths shall be acceptable matching with Tower Schedule and allowable wastage of 1% added. Standard Length shall not more than 2500 meters. All lengths outside this limit of tolerance shall be treated as random lengths.

Random lengths will be accepted provided no length is less than 70% of the standard length and the total quantity of such random lengths shall not be more than 10% of the total quantity ordered. When one number random length has been manufactured at any time, five (5) more individual lengths each equivalent to the above random length with a tolerance of +/- 5% shall also be manufactured and all the above six random lengths shall be dispatched in the same shipment. At no point, the cumulative quantity supplied of such random lengths shall not be more than 12.5% of the total cumulative quantity supplied including such random lengths. However, the last 20% of the quantity ordered shall be supplied only in standard lengths as specified.

Bidder shall also indicate the maximum single length, above the standard length, he can manufacture in the guaranteed technical particulars of offer. This is required for special stretches like river crossing etc. The Employer reserves the right to place orders for the above lengths on the same terms and conditions applicable for the standard lengths during the pendency of the Contract.

14.8 Supervision in Stringing

14.8.1 The installation & hotline restringing of the offered HTLS conductor for the above transmission line shall be carried out by the transmission line contractor under supervision of the HTLS conductor supplier or Qualified Bidder itself. Bidder's responsibility is to provide Sag- Tension chart based on existing site conditions. It may be noted that AEGCL will not consider any modifications (tower extensions etc) on existing tower/span.

14.8.2 The circuit on which the existing ASCR conductor is strung shall be kept under charged condition during the execution. The installation & stringing of the offered HTLS conductor for the above transmission line shall be carried out by the transmission line contractor under supervision of the HTLS conductor supplier or Qualified Bidder is self shall string the circuit with the HTLS conductor section by section and restore the line in original conditions as per program finalized in co-ordination with site. The bidder's engineers are to supervise whether appropriate safety measures along with necessary safety tools and equipment's to carry out stringing operations under the above conditions including mechanical/ structural safety of the towers, are maintained or not.

14.8.3 Necessary calculations shall be carried out by the bidder to ensure that by replacing the existing ASCR

conductor with the HTLS conductor, the loadings on the towers due to conductor tens-ions as well as loads on account of the re-conductoring activities shall be within specified limits. These calculations shall be submitted by the bidder along with bid.

14.8.4 The Contractor should deploy hotline stringing/ installation experts during erection of the offered HTLS conductor.

14.9 Tests and Standards

14.9.1 Type Tests

Type Tests on Stranded Conductor/ Stranded wire

The following tests shall be conducted once on sample/samples of conductor from each manufacturing facility:

(i)	**On complete Conductor**	
a)	DC resistance test on stranded conductor	: As per Annexure-A
b)	UTS test on stranded conductor	: As per Annexure-A
c)	Stress- Strain test on stranded conductor and core at room temperature	: IEC 1089
d)	Stress-strain test on stranded conductor and core at elevated temperature	: As per Annexure-A
e)	High temperature endurance & creep test on stranded conductor	: As per Annexure-A & : IEC 1089
f)	Sheaves Test	As per Annexure-A
g)	Axial Impact Test	: As per Annexure-A
h)	Radial Crush Test	: As per Annexure-A
i)	Torsional Ductility Test	: As per Annexure-A
j)	Aeolian Vibration Test`	: As per Annexure-A
k)	Temperature Cycle Test	: As per Annexure-A
l)	Corona Extinction Voltage Test	: As per Annexure-A
m)	Radio Interference Voltage Test	: As per Annexure-A
(ii)	**On Conductor Strand/core**	
a)	Heat resistance test on Aluminium Alloy strands or core	: As per Annexure-A
b)	Bending test on composite core	As per ASTM B987
c)	Compression test on core	: As per Annexure-A
d)	Coefficient of linear expansion on core/core strands	: As per Annexure-A
e)	Strand Brittle fracture test for Carbon fibre composite core only.	: As per Annexure-A

Type tests specified under clause no. 2.9.1 shall not be required to be carried out if a valid test certificate is available for the offered design, i.e., tests conducted earlier (not more than 5 years old at the time of bid opening) should have been conducted in accredited laboratory (accredited based on ISO/IEC guide 25/17025 or EN 45001 by the National Accreditation body of the country where laboratory is located) or witnessed by the representative (s) of CTU or State Transmission Utility.

Type test of Panther equivalent HTLS conductors of minimum 600A shall only be accepted for this project.

In the case of composite core conductors, the tests specified under clause 2.9.1 shall be carried out before stranding on as manufactured sample.

In the event of any discrepancy in the test report (i.e., any test report not applicable due to any design/ material/manufacturing process change including substitution of components or due to non- compliance with the requirement stipulated in the Technical Specification) the tests shall be conducted by the Contractor at no extra cost to the Employer/ Employer/ Employer.

14.9.2 Acceptance Tests (Whichever applicable to Annealed Al. HTLS Conductor)

a)	Visual and dimensional check on drum	: As per Annexure-A
b)	Visual check for joints scratches etc. and length measurement of conductor by rewinding	: As per Annexure-A
c)	Dimensional check on core strands and Aluminium Alloy strands	: As per Annexure-A
d)	Check for lay-ratios of various layers	: As per Annexure-A
e)	Thickness of aluminum on aluminium clad wires	: As per Annexure-A
f)	Torsion and Elongation tests on composite core	: As per Annexure-A
g)	Breaking load test on core strands and Aluminium/Aluminium Alloy strands	: As per Annexure-A
h)	Minimum conductivity test on Aluminium/ thermal resistant Aluminium Alloy strands	: As per IEC : 889
i)	Procedure qualification test on welded joint of Aluminium/Aluminium Alloy strands	: As per Annexure-A
j)	Heat resistance test on Aluminium Alloy strands	: As per Annexure-A
k)	Ageing test on filler (if applicable)	: As per Annexure-A
l)	Minimum conductivity test on aluminium clad core wires (if applicable)	: As per Annexure-A
m)	Glass transition temperature test (For Carbon fibre Composite core only) before stranding.	: As per Annexure-A
n)	Flexural Strength test (For Polymer Composites only) before stranding.	: As per Annexure-A
o)	Galvanic Layer thickness test (For Polymer Composites only) before stranding.	: As per ASTM B987
Note:	All the above tests shall be carried out on Aluminium / Aluminium Alloy and core as specified.	

14.9.3 Routine Test

a)	Check to ensure that the joints are as per Specification
b)	Check that there are no cuts, fins etc., on the strands.
c)	Check that drums are as per Specification
d)	All acceptance tests as mentioned above to be carried out on 10 % of drums

14.9.4 Tests during Manufacture

a)	Chemical analysis of zinc used for galvanizing	: As per Annexure-A
b)	Chemical analysis of Aluminium alloy used for making Aluminium Alloy strands	: As per Annexure-A
c)	Chemical analysis of core strands/composite core	: As per Annexure-A

As indicated in Clause no 2.9.1, no type test charges shall be payable to the supplier.
The entire cost of testing for the acceptance and routine tests and Tests during manufacture as well as type tests, if required, specified herein shall be treated as included in the quoted unit price of conductor, except for the expenses of the inspector/Owner's representative.

The Supplier shall intimate the Employer about carrying out of the type tests along with detailed testing program at least 2 weeks in advance of the schedule date of testing during which the Owner will arrange to depute his

representative to be present at the time of carrying out the tests.

14.10 Additional Tests

2.10.1. The Owner reserves the right of having at his own expenses any other test(s) of reasonable nature carried out at Supplier's premises, at site or in any other place in addition to the aforesaid type, acceptance and routine tests to satisfy himself that the materials comply with the Specifications.

2.10.2. The Owner also reserves the right to conduct all the tests mentioned in this specification at his own expense on the samples drawn from the site at Supplier's premises or at any other test centre. In case of evidence of non compliance, it shall be binding on the part of Supplier to prove the compliance of the items to the technical specifications by repeat tests, or correction of deficiencies, or replacement of defective items all without any extra cost to the Owner.

14.11 Test Reports

Record of routine test reports shall be maintained by the Supplier at his works for periodic inspection by the Employer's representative.

Test Certificates of tests during manufacture shall be maintained by the Supplier. These shall be produced for verification as and when desired by the Employer.

14.12 Inspection

The Employer's representative shall at all times be entitled to have access to the works and all places of manufacture, where conductor shall be manufactured and representative shall have full facilities for unrestricted inspection of the Supplier's works, raw materials and process of manufacture for conducting necessary tests as detailed herein.

The Supplier shall keep the Employer informed in advance of the time of starting and of the progress of manufacture of conductor in its various stages so that arrangements can be made for inspection.

No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested, unless the inspection is waived off by the Employer in writing. In the latter case also, the conductor shall be dispatched only after satisfactory testing for all tests specified herein have been completed.

The acceptance of any quantity of material shall in no way relieve the Supplier of any of his responsibilities for meeting all requirements of the Specification, and shall not prevent subsequent rejection if such material is later found to be defective.

14.13 Test Facilities

The following additional test facilities shall be available at the Supplier's works:

a) Calibration of various testing and measuring equipment including tensile testing machine, resistance measurement facilities, burette, thermometer, barometer etc.

b) Standard resistance for calibration of resistance bridges.

c) Finished conductor shall be checked for length verification and surface finish on separate rewinding machine at reduced speed (variable from 8 to 16 meters per minute). The rewinding facilities shall have appropriate clutch system and free of vibrations, jerks etc. with traverse laying facilities.

14.14 Packing

The conductor shall be supplied in non-returnable, strong, wooden/painted steel/hybrid (painted steel cum wood) drums provided with lagging of adequate strength, constructed to protect the conductor against all damage and displacement during transit, storage and subsequent handling and stringing operations in the field. The Supplier shall select suitable drums for supply of conductor and shall be responsible for any loss or damage to conductor and/or drum during transportation handling and storage due to improper selection of drum or packing.

The Bidder should submit their proposed drum drawings along with the Bid.

a. One conductor length only shall be wound on each drum.

b. The conductor ends shall be properly sealed and secured on the side of one of the flanges to avoid loosening of the conductor layers during transit and handling.

14.15 Marking

Each drum shall have the following information stenciled on it in indelible ink along with other essential data:

a. Contract/Award letter number.
b. Name and address of consignee.
c. Manufacturer's name and address.
d. Drum number
e. Size of conductor
f. Length of conductor in meters
g. Arrow marking for unwinding
h. Position of the conductor ends
i. Distance between outer-most Layer of conductor and the inner surface of lagging.
j. Barrel diameter at three locations & an arrow marking at the location of the measurement.
k. Number of turns in the outer most layer.
l. Gross weight of drum after putting lagging.
m. Tear weight of the drum without lagging.
n. Net weight of the conductor in the drum.

The above should be indicated in the packing list also.

14.16 Service centre in India: If any manufacturer is from outside INDIA, they must have their service centre and calibration facilities in India.

14.17 Verification of Conductor Length

The Employer reserves the right to verify the length of conductor after unreeling at least ten (10) percent of the drums in a lot offered for inspection.

14.18 Standards (Whichever applicable to Annealed Al. non-metallic solid core HTLS Conductor)

The conductor shall conform to the following Indian/International Standards, which shall mean latest revisions, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification.

In the event of the supply of conductor conforming to standards other than specified, the Bidder shall confirm in his bid that these standards are equivalent to those specified. In case of award, salient features of comparison between the standards proposed by the Supplier and those specified in this document will be provided by the Supplier to establish their equivalence.

Sl. No.	Indian Standard	Title	International Standard
1.	IS: 209-1992	Specification for zinc	BS:3436-1986
2.	IS: 398-1982	Specification for Aluminium Conductors for Overhead Transmission Purposes	IEC:1089-1991 BS:215-1970
3.	IS:398-1990 Part-II	Aluminum Conductor Galvanised Steel Reinforced	BS;215-1970 IEC:1089-1991
4.	IS:398-1992 Part-V	Aluminum Conductor Galvanised Steel-Reinforced for Extra High Voltage (400 KV) and above	IEC:1089-1991 BS:215-1970
5.	IS : 1778-1980	Reels and Drums for Bare Conductors	BS:1559-1949
6.	IS : 1521-1991	Method of Tensile Testing of Steel Wire	ISO 6892-1984
7.	IS : 2629-1990	Recommended Practice for Hot Dip Galvanising of Iron and Steel	
8.	IS : 2633-1992	Method of Testing Uniformity of Coating on Zinc Coated Articles	

9.	IS : 4826-1992	Galvanised Coating on Round Steel Wires	IEC : 888-1987 BS:443-1969
10.	IS : 6745-1990	Methods of Determination of Weight of Zinc Coating of Zinc Coated Iron and Steel Articles	BS:433-1969 ISO 1460 - 1973
11.	IS : 8263-1990	Method of Radio Interference Tests on High Voltage Insulators	IEC:437-1973 NEMA:107-1964 CISPR
12.	IS : 9997-1988	Aluminium Alloy Redraw Rods	IEC 104 - 1987
13.		Zinc Coated steel wires for stranded Conductors	IEC : 888-1987
14.		Hard drawn Aluminium wire for overhead line conductors	IEC : 889-1987
15.	IS:398 (Part-IV)	Aluminium Alloy stranded conductor	IEC : 208-1966 BS-3242-1970
16.		Aluminium clad steel wires	IEC:1232
17.		Method of measurement of resistivity of metallic materials	IEC:468
18		Ampacity	IEEE738
19.		Design Validation Tests on Composite Core	ASTM B987

SCHEDULE—1 (A)
Tower Schedule enclosed.
ANNEXURE –A

Tests on Conductors

1) Tests on Conductor (Whichever applicable to Annealed Al. non-metallic solid core HTLS Conductor)

1.1 UTS Test on Stranded Conductor

Circles perpendicular to the axis of the conductor shall be marked at two places on a sample of conductor of minimum 5 m length between fixing arrangement suitably fixed by appropriate fittings on a tensile testing machine. The load shall be increased at a steady rate upto 50% of minimum specified UTS and held for one minute. The circles drawn shall not be distorted due to relative movement of strands. Thereafter the load shall be increased at steady rate to minimum UTS and held for one minute. The Conductor sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

1.2 Corona Extinction Voltage Test

The sample when subjected to power frequency voltage shall have a corona extinction voltage of not less than 154
kV rms line to ground under dry condition. There shall be no evidence of corona on any part of the sample. The atmospheric condition during testing shall be recorded and the test results shall be accordingly corrected with suitable correction factor as stipulated in IS:731- 1971

1.3 Radio Interference Voltage Test

Under the conditions as specified under (1.2) above, the sample shall have a radio interference voltage level below 1000 microvolts at one MHz when subjected to 50 Hz AC voltage of 154 kV rms line to ground under dry condition. The test procedure shall be in accordance with IS:8263.

1.4 D.C. Resistance Test on Stranded Conductor

On a conductor sample of minimum 5m length two contact-clamps shall be fixed with a predetermined bolt torque. The resistance shall be measured by a Kelvin double bridge or using micro ohm meter of suitable accuracy by placing the clamps initially zero metre and subsequently one metre apart. The test shall be repeated at least five times and

the average value recorded. The value obtained shall be corrected to the value at 20deg C as per IS:398-(Part-IV)/(Part-V). The resistance corrected at 20deg C shall conform to the requirements of this Specification.

1.5 Stress-strain test at elevated temperature

Stress-strain test as per IEC-1089 shall be conducted keeping conductor temperature at designed maximum temperature.

1.6 High Temperature endurance & creep test

Two conductor samples of length equal to at least 100 X d + 2 X a (where, d is the conductor diameter and a is the distance between the end fitting and the gauge length) shall be strung at tension equal to 25 % of conductor UTS. The distance, a, shall be at least 25 % of the gauge length or 2 m whichever is the smaller. The conductor samples shall be subjected to tests as indicated below:

On one of the conductor samples, the conductor temperature shall be maintained at 20 deg C for 1000 hours. The elongation/creep strain of the conductor during this period shall be measured and recorded at end of 1 hour, 10-hour, 100 hour and subsequently every 100-hour upto 1000 hours' time period. (On other conductor sample, the conductor temperature shall be increased to design maximum temperature in steps of 20 deg. C and thermal elongation of the conductor sample shall be measured & recorded at each step. The temperature shall be held at each step for sufficient duration for stabilization of temperature. Further, the temperature of the conductor shall be maintained at maximum continuous operating temperature (+10 Deg. C) for 1000 hours. The elongation/creep strain of the conductor during this period shall be measured and recorded at end of 1 hour, 10-hour, 100 hour and subsequently every 100-hour upto 1000 hours' time period. After completion of the above, the core of the conductor sample shall be subjected to UTS test as mentioned above at clause 1.1 of Annexure-A. The conductor core shall withstand a load equivalent to 95 % of UTS. In case of polymer composite core conductor, the flexural strength & glass transition temperature of the core shall also be evaluated and the same shall not be degraded by more than 10 % over the initial value. The supplier shall plot the thermal elongation with temperature.

The supplier shall furnish details of creep characteristic in respect of the conducted based on laboratory test and other laboratory investigations/ experimental conducted on similar type of conductor and shall indicate creep strain values corresponding to 1 month, 6 month, 1 year, 10 year & 20 year creep at everyday tension & continuous designed temperature as well as room temperature.

1.7 Sheaves Test

The conductor sample of minimum length of 35 meter shall be tensioned at 22 % of the UTS and shall be passed through pulleys having diameter of 32 times that of the conductor with angle of 20 deg. between the pulleys. The conductor shall be passed over the pulleys 36 times a speed of 2 m/sec. After this test UTS test on the conductor shall be carried out. The core shall be inspected for any sign of damage or cracking through dye penetration test as per ASTM D5117.

1.8 Axial Impact Test

The conductor sample shall be suspended vertically and load applied by dropping a 650 Kg from an elevation of 4 meters above the sample. The impact velocity shall be not be less than 8 m/sec. with an initial pre-tension of 200 kg. The curve for load vs time shall be recorded and recorded load of failure for core shall not be less than UTS of core.

1.9 Radial Crush Test

A section of conductor is to be crushed between two six-inch steel platens. Load shall be held at 350 Kg for 1 minute and then released. Core/ core strands shall be subsequently disassembled and tensile tested. Core/ core strands shall exhibit full strength retention.

1.10 Torsional Ductility Test

The conductor sample of 10-15 m shall be loaded to 25% of UTS and then rotated in increasing steps of +/-180 deg. In case of composite core conductors, after 4 rotations or after separation of aluminium strands, the aluminium wires shall be cut and removed from the conductor and the exposed core shall be twisted and shall withstand upto 16 rotations.

1.11 Aeolian Vibration Test

The conductor and supporting hardware shall be loaded to 25% of RTS. A dynamometer, load cell, calibrated beam or other device shall be used to measure the conductor tension. Some means should be provided to maintain constant tension to allow for temperature fluctuations during the testing. The overall span between system terminations shall be a minimum of 30 m. The span shall be supported at a height such that the static sag angle of the cable to horizontal is (1.5 + 0.5) deg in the active span. Means shall be provided for measuring and monitoring the mid-loop (antinode) vibration amplitude at a free loop, not a support loop. An electronically controlled shaker shall be used to excite the conductor in the vertical plane. The shaker armature shall be securely fastened to the conductor so it is perpendicular to the conductor in the vertical plane. The shaker should be located in the span to allow for a minimum of six vibration loops between the suspension assembly and the shaker.

The test shall be carried out at one or more resonance frequencies (more than 10 Hz). The amplitude at the antinode point shall be one third of conductor diameter. The assembly shall be vibrated for not less than 10 million cycles without any failure. After the test, the conductor should not exhibit any damage (broken strands). The conductor shall be tested to demonstrate that it retains at least 95% RTS.

1.12 Temperature Cycle Test

The purpose of this test is verification of degradation characteristics of metallic and non-metallic material when subjected to thermal cycling temperature cycling can create large internal stresses due to thermal expansion mismatch between constituents.

Test Methods: -

- Mechanical tension, 20 % RBS, marks on the conductor at the edge of the conductor.
- 100 cycles from room temperature up to maximum temperature. Hold at design maximum temperature ± 2.5 deg. C for 5 minutes.
- After the above mentioned 100 cycles, the mechanical tension shall be increased up to 70 % RBS at room temperature and kept at this tension for 24 H. Thereafter release to 20 % RBS.
- This cycling test shall be repeated 5 times.
- During the test, temperature of connectors, conductor and resistance are recorded according to ANSI C 119.
- A breaking load test is applied at the end of the test. Conductor strength has to be higher than 95% RBS.

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.

1.13 Heat Resistance test on Aluminium Alloy wire

Breaking load test as per clause 1.12 above shall be carried out before and after heating the sample in uniform heat furnace at following temperature for one hour. The breaking strength of the wire after heating shall not be less than the 90% of the breaking strength before heating: -

Maximum continuous operating temperature of the conductor	Test Temperature
Upto 150 deg. C	230 degC (+5/-3 degC)
More than 150 deg. C & upto 210 deg. C	280 degC (+5/-3 degC)
More than 210 deg. C & upto 230 deg. C	400 degC (+5/-3 degC)

1.14 Bending test on aluminium clad core wire (if applicable)

A sample of aluminium clad invar strand measuring 30 cm in length shall be subject to bending with help of a vise. The vised length of wire should be 5 cm and radius of bend 4.8 mm. The bending should be first 90 degrees left and 90-degree right. After this operation the strand should cut at the bending point. There should be no separation of core and aluminium at the bending point after this operation.

1.15 Compression test on aluminium clad wires (if applicable)

A sample of aluminium clad core strand 10 mm in length is to be compressed by a plate with a load of 3600 kgs.

The aluminium and core strand should not break.

1.16 Coefficient of linear expansion for core/ corewires

The temperature and elongation on a sample shall be continuously measured and recorded at interval of approximately 15 degree C from 15 degree C to maximum continuous operating temperature corresponding to rated current 600A (132kV) by changing the temperature by suitable means. Coefficient of linear expansion shall be determined from the measured results.

1.17 Strand Brittle fracture test (for polymer composite core only)

The sample shall be tensioned to approx. 25 % of UTS with simultaneous application of 1NHNO3 acid directly in contact with naked polymer composite core for 96 hrs. The contact length of acid shall not be less than 40mm and thickness around the core not less than 10mm.The rod shall withstand UTS test after 96 hours.

1.18 Visual and Dimensional Check on Drums

The drums shall be visually and dimensionally checked to ensure that they conform to the approved drawings.

1.19 Visual Check for Joints, Scratches etc.

Conductor drums shall be rewound in the presence of the Employer. The Employer shall visually check for scratches, joints etc. and that the conductor generally conform to the requirements of this Specification. Ten percent (10%) drums from each lot shall be rewound in the presence of the Employer's representative.

1.20 Dimensional Check on Core Wires and Aluminium/ Aluminium Alloy Wires

The individual strands shall be dimensionally checked to ensure that they conform to the requirement of this Specification.

1.21 Check for Lay-ratios of Various Layers

The lay-ratios of various layers shall be checked to ensure that they conform to the guaranteed values furnished by the Contractor.

1.22 Galvanizing Test

The test procedure shall be as specified in IEC: 888. The material shall conform to the requirements of this Specification. The adherence of zinc shall be checked by wrapping around a mandrel four times the diameter of steel wire.

1.23 Aluminum thickness on aluminum clad wires (if applicable)

The thickness of aluminium of the specimen shall be determined by using suitable electrical indicating instruments operating on the direct measurement. Measurements shall be read to three decimal places, and number rounded to two decimal places is considered as measured thickness. For reference purposes, direct measurement shall be used to determine aluminium thickness on specimens taken from the end of the coils.

1.24 Torsion and Elongation Tests on Composite Core

In case of composite core HTLS conductor, the following procedure shall be applicable: -

Elongation Test: - The elongation of the composite core sample at shall be determined using extensometer. The load along the core shall be gradually increased. The elongation achieved on reaching the tensile strength of the core shall not be less than the value guaranteed in the GTP.

Torsion Test: The purpose of the test is to determine the resilience of the composite core to twisting and to show that after the composite core has experienced the prescribed twisting, it will not crack or have a loss in tensile strength due to the twisting. A sample length that is 170 times the diameter of the composite core being tested is mounted in the gripping fixtures. One grip shall then be fixed so that it does not twist and the other end shall be twisted a full 360 degrees and then fixed in this position for 2 minutes. Once the twist time is completed, the core is untwisted an inspected for any crazing or other damage. If no damage is observed, the composite core is then tensile tested to failure and the

final load recorded. For the test to be accepted, the composite core must withstand at least 100% of its rated tensile strength. Two samples need to be completed in order to satisfy the testing requirement.

1.25 Breaking load test on Aluminium/ Aluminium Alloy & Composite core and D.C Resistance test on Aluminium/ Aluminium Alloy wire

The above tests shall be carried out as per IEC: 888/889 and the results shall meet the requirements of the specification.

1.26 Wrap test on Core wires (Applicable for steel/Al clad Steel/invar core only)

The wrap test on core strands shall be meet the requirements of IEC: 888. In case of aluminium clad core wire, the same shall be wraped around a mandel of diameter of five times that of the strand to form a helix of eight turns. The strand shall be unwrapped. No breakage of strand shall occurred.

1.27 Minimum conductivity test on thermal resistant aluminium alloy wire

Resistivity test as per IEC-468/IEC 889 shall be conducted to confirm minimum conductivity as per specification requirement

1.28 Procedure Qualification test on welded Aluminium/ Aluminium Alloy wire.

Two Aluminium/ Aluminium Alloy wire shall be welded as per the approved quality plan and shall be subjected to tensile load. The breaking strength of the welded joint of the wire shall not be less than the guaranteed breaking strength of individual strands.

1.29 Ageing Test on Filler (if applicable)

The test shall be done in accordance with Grease drop point test method. The specimen should be drop as a droplet when kept at a temperature 45 deg. C above designed maximum operating temperature of the conductor for 30 minutes. The temperature shall then be increase till one droplet drops and the temperature recorded.

1.30 Aluminium conductivity test on aluminium clad wire (if applicable)

Resistivity test as per IEC-468 shall be conducted to confirm minimum conductivity as per specification requirement.

1.31 Glass Transition Temperature Test (for polymer composite core only)

Test method shall be as per ASTM D7028, A Standard Test Method for Glass Transition Temperature of Polymer Matrix Composites by Dynamic Mechanical Analysis. The glass transition temperature shall be greater than the maximum continuous operating temperature of the offered Composite Carbon Core HTLS Conductor+ 35 deg C.

1.32 Flexural Strength Test (for polymer composite coreonly)

Test method shall be as per ASTM D7264, ASTM D4475 or ISO14125.

1.33 Bending Test on Composite Core:

A composite core sample shall be wrapped 180 degree around a cylindrical mandrel, and the specimen brought to 15 % of the rated tensile strength of the composite core and held for 1 min. The mandrel diameter shall be not more than 50 times the dia of composite core. After completion of the test, the core shall withstand UTS test and dye penetration test.

1.34 Chemical Analysis of Aluminium/ Aluminium Alloy and Composite core/ INVAR Core Wires

Samples taken from the Aluminium /Aluminium Alloy and core coils/ strands shall be chemically/spectrographically analyzed. The same shall be in conformity to the particulars guaranteed by the bidder so as to meet the requirements stated in this Specification.

1.35 Chemical Analysis of Zinc

Samples taken from the zinc ingots shall be chemically/ spectrographically analyzed. The same shall be in conformity to the requirements stated in the Specification.

Note: Any other type test required as per relevant IS/IEC/other standards shall be submitted along with the bid for the offered HTLS conductor