

APAR INDUSTRIES LIMITED CONDUCTORS DIVISON

Marketing & Registered office : 301, Panorama Complex,

RC Dutt Road, Vadodara, Gujarat,India 390 007.

CLIENT: BIHAR STATE POWER TRANSMISSION COMPANY LTD.

CONTRACTOR: APAR INDUSTRIES LIMITED

PROJECT: Supply contract for design, manufacture, testing at manufacture's works and delivery of equipment's required for Re-conductroring work of 06 Nos. 132kV Transmission Line with HTLS equivalent to ACSR Panther Conductor: (i) 132 KV Motihari (DMTCL)- Bettiah DCDS T/L (ii) 132 KV Musahari-Sitamarhi DCDS T/L (iii) 132 KV Motipur-Motihari DCSS T/L (iv) 132 KV Supaul -Nirmali DCSS T/L (v) 132 KV Supaul -Phulparas DCSS T/L (vi) 132 KV Phulparas - Nirmali DCSS T/L on turnkey basis under special essistance to states for capital investment for 2023-24 against NIT No. 18/PR/BSPTCL/2023.

NOA No.: 14-Trans/Misc/P-I/33/2023 Dated: 22.09.2023 & 15-Trans/Misc/P-I/33/2023 Dated: 22.09.2023

GUARANTEED TECHNICAL PARTICULARS OF "ACCC HTLS" (EQUIVALENT TO PANTHER) " CONDUCTOR

For Span 233 meters State	COND	UCTOR		
APAR INDUSTRIES LTD Address of Manufacturer Address of Manufacturer Construction of conductor / Designation of conductor as per IEC.61089 Particulars of Raw Material Construction of conductor / Designation of conductor as per IEC.61089 Particulars of Raw Material Designation of Conductor stand. Subject to the condiction that you are not absolved of iii) Subject to the condition that you are not absolved of iii Subject to the condition that you are not absolved of iii Subject to the condition that you are not absolved of iii Subject to the condition that you are not absolved or iii Subject to the condition that you are not absolved or iii Subject to the condition that you are not absolved or iii Subject to the condition that you are not absolved or iii Subject to the condition that you are not		For Span 233 meters		
Address of Manufacturer Note of the conductor Construction of conductor / Designation of conductor as per IEC:61089 Particulars of Raw Material Outer Layers a) Type of conductor strand. b) Chemical composition of Condition that you are not absolved of its responsibility for correctness of the materials iii) Fe subject to the condition that you are not absolved of iii) Si subject to the condition that you are not absolved of iii) Fe responsibility for correctness of the materials iii) Fe subject to the condition that you are not absolved of iii) Fe responsibility for correctness of the materials iii) Fe subject to the condition that you are not absolved of iii) Fe responsibility for correctness of the materials iii) Fe responsibility for corre	SI	Description	Unit	Value guaranteed by the Bidder
3 Name of the conductor 4 Construction of conductor / Designation of conductor as per IEC.61089 5 Particulars of Raw Material 5.1 Outer Layers a) Type of conductor strand. 5.2 Inher Core Bhat State Power Transmission Company Limited at Material 10.01 (max) b) Clemical composition of Conductor strand. 6 Outer Aluminium / Aluminium Alloy Strand after Stranding 6.1 Number of outer layers a) Nominal b) Maximum c) Minimum Breaking load of strand at 20 deg, C Ohm Inher core stranding Number of layers in inner core a) Maximum c) Minimum Breaking load of strand at 0 deg, C Ohm Inher core stranding Number of layers tranding Number of layers in inner core a) Maximum c) Minimum Breaking load of strand at 20 deg, C Ohm Inher core stranding Number of layers in inner core a) Maximum c) Minimum c) Minimu	1	Name of Manufacturer		APAR INDUSTRIES LTD
4 Construction of conductor / Designation of conductor as per IEC.61089 5 Particulars of Raw Material 5.1 Outer Layers a) Type of conductor strand. 5.2 Under Layers b) Chemical composition of Condition that you are not absolved of ii) Si iii) Fe responsibility for correctness of the materials iii) Fe respon	2	Address of Manufacturer		INDIA
IEC:61089 An.Al. 8/4.06mm (TW) + composite core 1/7.11 mm (R)	3	Name of the conductor		ACCC CASABLANCA
IEC:61089 An.Al. 8/4.06mm (TW) + composite core 1/7.11 mm (R)	4	Construction of conductor/ Designation of conductor as per		An.Al.12/4.25mm (TW) +
5. Particulars of Raw Material 5.1 Outer Layers a) Type of conductor strand. 1350 O-tempered aluminum as per ASTM 8233, ASTM 8 609 5) Chemical composition of Conductor Strand. 5) Chemical composition of Conductor Strand Str				An.Al. 8/4.06mm (TW) +
3.1 Outer Layers a) Type of conductor strand. b) Chemical composition of Conductor Strand. b) Chemical composition of Conductor Strand. c) Al. Subject to the condition that you are not absolved of the responsibility for correctness of the materials to the responsibility for correctness of the respo				composite core 1/7.11 mm (R)
a) Type of conductor strand. 1350 O-tempered aluminum as per ASTM 8233, ASTM 8 609 b) Chemical composition of Cartiflation (No. 1) Al. Subject to the condition that you are not absolved of the responsibility for correctness of the materials will be responsible to the condition of the responsibility of the correct will be responsible to the condition of the responsibility of the condition of the materials will be condition of the co	5	Particulars of Raw Material		
b) Chemical composition of Control (1) Al. i) S. Subject to the condition that you are not absolved of the responsibility for correctness of the materials will be supplied as per specification will be supplied will be supplied as per specification will be sup	5.1	Outer Layers		
b) Chemical composition of Cardiff and Company		a) Type of conductor strand.		1350 O-tempered aluminum as per
ii) Al. iii) Si Subject to the condition that you are not absolved of iii) Si the responsibility for correctness of the materials iii) Fe supplied as per specification (0.10 (max) 0.04 (max) 0.04 (max) 0.04 (max) 0.07 (max) 0.077 (max) 0.07 (• •		ASTM B233, ASTM B 609
ii) Al. iii) Si Subject to the condition that you are not absolved of iii) Si the responsibility for correctness of the materials iii) Fe supplied as per specification (0.10 (max) 0.04 (max) 0.04 (max) 0.04 (max) 0.07 (max) 0.077 (max) 0.07 (Note that the second of the se		· ·
ii) Si Subject to the condition that you are not absolved of iii) Fe the responsibility for correctness of the materials ii) Cu supplied as party specification (0.04 (max) (0.02 (max) (m			0,	00.50 (;)
iii) Fe supplied as per specification (0.40 (max)) (11 + Va (12 + Va)) (12 + Va) (13 + Va) (14 + Va) (15 + Va) (15 + Va) (16 + Va) (16 + Va) (17 +		Subject to the condition that you are not absolved	107	` ′
		the responsibility for correctness of the materia	als [%]	
V) Ti + Va Vi) Mn Electrical Superinie Ing Engineer Vii) Mn Vii) Mn Viii) Cr (Planning and Engineering) Wiii) Cr (Planning and Engineering) Viii) Viii) Viiii) Viiii) Viiii) Viiii) Viiii) Viiii) Viiii) Viiiii) Viiii) Viiii) Viiiii) Viiiiii) Viiiiii) Viiiiii) Viiiiii) Viiiiiii) Viiiiiii) Viiiiiiii) Viiiiiiiiii		supplied as per specification	%	' '
vi) Mn viii) Cr viii) Cr linner Core a) Materials Get 1 20 dy ut Bhawan, Patna-800021 b) Chemical composition of core i) — ii) — iii) — iv) — vi — vi — core as per ASTM B987 Hybrid carbon and glass fiber composite core as per ASTM B987 Hybrid carbon and glass fiber composite core as per ASTM B987 Hybrid carbon and glass fiber composite core as per ASTM B987 Hybrid carbon and glass fiber composite core as per ASTM B987 Hybrid carbon and glass fiber composite core as per ASTM B987 Hybrid carbon and glass fiber composite core as per ASTM B987 Hybrid carbon and glass fiber composite core as per ASTM B987 Hybrid carbon and glass fiber composite core as per ASTM B987 Nos. 2 Light 1 Layer 1 / Layer 2 a) Nominal mm 4.06mm (IW) / 4.25mm (IW) Alloumer (IW) / 4.25mm (IW) Allouminum Breaking load of strand a) Before stranding KN 0.777 / 0.851 b) After stranding KN 0.777 / 0.851 loner core strands/inner core after stranding Number of layers in inner core a) Nominal b) Maximum c) Minimum Breaking load of strand/Core a) Before stranding b) After strandi		IV) Cu		
Planning and Engineer		(CC)	%	0.02 (max)
Viii) Cr Bihar State Power Transmission Company Limited a) Material Of Composition of core i) —		Electrical Cupartition (Inc. Engineer	. %	0.01 (max)
5.2 Inner Core a) Material of the Power Transmission Company Limited b) Chemical composition of core i)		(Dispring and Engineering)	%	0.01 (max)
a) Majorate of the transfer of		Pihar State Power Transmission Company Lim	ited %	0.01 (max)
b) Chemical composition of core i)	5.2	niller Cole		
b) Chemical composition of core		a) Material of die		Hybrid carbon and glass fiber composite
		No.		core as per ASTM B987
		b) Chemical composition of core		
iii	į,	i) ——	%	-
iv)		ii) ———————————————————————————————————	%	-
v) — % - vi) — % - 6 Outer Aluminium / Aluminium Alloy Strand after Stranding Nos. 2 6.1 Number of outer layers Nos. 2 6.2 Diameter Layer 1 / Layer 2 a) Nominal mm 4.06mm (TW) / 4.25mm (TW) b) Maximum mm 4.10mm (TW) / 4.29mm (TW) c) Minimum Breaking load of strand a) Before stranding KN 0.777 / 0.851 b) After stranding KN 0.778 / 0.809 6.4 Resistance of 1m length of strand at 20 deg. C Ohm 0.002156 / 0.001965 7 Inner core strands/inner core after stranding No 1 7.1 Number of layers in inner core No 1 a) Nominal mm 7.11 b) Maximum mm 7.16 c) Minimum mm 7.16 mm 7.06		•	%	_
vi		iv) ——	%	_
6.1 Number of outer layers 6.2 Diameter a) Nominal b) Maximum c) Minimum Breaking load of strand a) Before stranding 6.4 Resistance of 1m length of strand at 20 deg. C Inner core strands/inner core after stranding 7.1 Number of layers in inner core a) Nominal b) Maximum c) Minimum 6.3 Minimum Breaking load of strand a) Before stranding b) After stranding 6.4 Resistance of 1m length of strand at 20 deg. C Inner core strands/inner core after stranding 7.1 Number of layers in inner core a) Nominal b) Maximum c) Minimum Breaking load of strand/Core a) Before stranding 7.3 Minimum Breaking load of strand/Core a) Before stranding KN 85.0		v)	%	_
6.1 Number of outer layers 6.2 Diameter a) Nominal b) Maximum c) Minimum 6.3 Minimum Breaking load of strand a) Before stranding b) After stranding 6.4 Resistance of 1m length of strand at 20 deg. C Inner core strands/inner core after stranding 7.1 Number of layers in inner core 7.2 Diameter a) Nominal b) Maximum c) Minimum d) Maximum d) Minimum Breaking load of strand/Core a) Before stranding Example 1 Layer 1 / Layer 2 Layer 1 / Layer 1 Layer 1 / Layer 2 Layer 1 / Layer 2 Layer 1 / Layer 2 Layer 1 / Layer 1 Layer 1 / Layer 2 Layer 1 / Layer 2 Layer 1 / Layer 2 Layer 1 / Layer 1 Layer		vi) ——		_
6.1 Number of outer layers 6.2 Diameter a) Nominal b) Maximum c) Minimum 6.3 Minimum Breaking load of strand a) Before stranding b) After stranding 6.4 Resistance of 1m length of strand at 20 deg. C Inner core strands/inner core after stranding 7.1 Number of layers in inner core 7.2 Diameter a) Nominal b) Maximum c) Minimum d) Maximum d) Minimum Breaking load of strand/Core a) Before stranding Example 1 Layer 1 / Layer 2 Layer 1 / Layer 1 Layer 1 / Layer 2 Layer 1 / Layer 2 Layer 1 / Layer 2 Layer 1 / Layer 1 Layer 1 / Layer 2 Layer 1 / Layer 2 Layer 1 / Layer 2 Layer 1 / Layer 1 Layer	6	Outer Aluminium / Aluminium Alloy Strand after Stranding		
6.2 Diameter a) Nominal b) Maximum c) Minimum Breaking load of strand a) Before stranding b) After strands/inner core after stranding 7.1 Number of layers in inner core a) Nominal b) Maximum c) Minimum Breaking load of strand 7.2 Diameter a) Nominal b) Maximum c) Minimum d. A.02mm (TW) / 4.29mm (TW) MM	6.1		Nos.	2
a) Nominal	6.2	Diameter		
b) Maximum c) Minimum mm 4.10mm (TW) / 4.29mm (TW) 6.3 Minimum Breaking load of strand a) Before stranding b) After stranding 6.4 Resistance of 1m length of strand at 20 deg. C 7 Inner core strands/inner core after stranding 7.1 Number of layers in inner core 7.2 Diameter a) Nominal b) Maximum c) Minimum Breaking load of strand/Core a) Before stranding 7.3 Minimum Breaking load of strand/Core a) Before stranding b) After stranding KN 4.10mm (TW) / 4.29mm (TW) 6.4 (2.20mm (TW) 6.20mm (TW) / 4.29mm (TW) 6.3 Minimum Breaking load of strand 6.4 (N) 6.5 (N) 6.5 (N) 6.6 (N) 6.7 (N) 6.7 (N) 6.8 (N) 6.8 (N) 6.9 (N		a) Nominal	mm	
c) Minimum A.02mm (TW) / 4.21mm (TW) 6.3 Minimum Breaking load of strand a) Before stranding b) After stranding KN 0.777 / 0.851 KN 0.738 / 0.809 6.4 Resistance of 1m length of strand at 20 deg. C Ohm 0.002156 / 0.001965 7.1 Number of layers in inner core 7.2 Diameter a) Nominal b) Maximum c) Minimum C) Minimum 7.11 7.3 Minimum Breaking load of strand/Core a) Before stranding b) After stranding KN 85.0		b) Maximum		
All Minimum Breaking load of strand a) Before stranding b) After stranding KN 0.777 / 0.851 b) After stranding KN 0.738 / 0.809 c.4 Resistance of 1m length of strand at 20 deg. C Ohm 0.002156 / 0.001965 c.5 Inner core strands/inner core after stranding c.6 Inner core strands/inner core after stranding c.6 Inner core strands/inner core Core a) No 1 Core a) Maximum Core a) Minimum Breaking load of strand/Core a) Before stranding b) After stranding Core a) STR/AN KN 85.0		c) Minimum		
a) Before stranding b) After stranding KN 0.777 / 0.851 b) After stranding KN 0.738 / 0.809 6.4 Resistance of 1m length of strand at 20 deg. C Ohm 0.002156 / 0.001965 7 Inner core strands/inner core after stranding 7.1 Number of layers in inner core 7.2 Diameter a) Nominal b) Maximum c) Minimum C) Minimum T.11 c) Minimum Breaking load of strand/Core a) Before stranding b) After stranding KN 85.0	6.3	Minimum Breaking load of strand		4.02mm (144) / 4.2mm (144)
b) After stranding 6.4 Resistance of 1m length of strand at 20 deg. C 7 Inner core strands/inner core after stranding 7.1 Number of layers in inner core 7.2 Diameter a) Nominal b) Maximum c) Minimum Breaking load of strand/Core a) Before stranding KN 0.738 / 0.809 No 1 1 7.11 mm 7.11 mm 7.16 mm 7.06			KNI	0.777 / 0.951
6.4 Resistance of 1m length of strand at 20 deg. C 7 Inner core strands/inner core after stranding 7.1 Number of layers in inner core 7.2 Diameter a) Nominal b) Maximum c) Minimum Breaking load of strand/Core a) Before stranding b) After stranding No Ohm 0.002156 / 0.001965 No 1 mm 7.11 mm 7.16 mm 7.06 KN 85.0				ar tron
Inner core strands/inner core after stranding 7.1 Number of layers in inner core 7.2 Diameter a) Nominal b) Maximum c) Minimum 7.16 Minimum Breaking load of strand/Core a) Before stranding b) After stranding No 1 7.11 mm 7.16 mm 7.06	6.4			
7.1 Number of layers in inner core 7.2 Diameter a) Nominal b) Maximum c) Minimum 7.16 mm 7.16 mm 7.17 Minimum Breaking load of strand/Core a) Before stranding b) After stranding b) After stranding	7	Inner core strands/inner core after stranding	Onm	0.002158 / 0.001965
7.2 Diameter a) Nominal b) Maximum c) Minimum 7.16 mm 7.16 mm 7.06 Minimum Breaking load of strand/Core a) Before stranding b) After stranding b) After stranding	7.1	Number of layers in inner core		_
b) Maximum c) Minimum Reaking load of strand/Core a) Before stranding b) After stranding c) Maximum mm 7.11 mm 7.16 mm 7.06 KN 85.0	7.2		INO	1
7.3 Minimum Breaking load of strand/Core a) Before stranding b) After stranding		a) Nominal		
c) Minimum mm 7.16 7.3 Minimum Breaking load of strand/Core a) Before stranding b) After stranding KN 85.0		b) Maximum		
a) Before stranding b) After stranding KN 85.0		c) Minimum		
a) Before stranding b) After stranding KN 85.0	7.3		mm	7.06
b) After stranding KN 85.0		a) Before stranding		
			KN	85.0
		102:00	KN	85.0

7.4	Min. no. of twists which a single strand shall withstand during torsion	Nos.	Not App	licable
	test for a length equal to 100times dia of wire after stranding.			
8	Complete conductor			
8.1	UTS of Conductor	KN	100	.4
8.2	Lay ratio of conductor (As per ASTM B857)		Maximum	Minimum
	a) 1 st layer (outer most layer)		13	10
	b) 2nd Layer		16	10
	c) 3rd Layer		-	
	d) 4th Layer		-	
8.3	Maximum permissible conductor temperature for continuous operation	Deg C	180)
8.4	Maximum permissible conductor temperature for short term operation	Deg C	200	0
8.5	Permissible duration of above short term operation	Minutes	30	
8.6	Maximum length of conductor that can be offered as single length	KM	2.5	5
8.7	DC resistance of conductor at 20°C	Ohm/km	0.10	24
8.8	AC resistance at maximum continuous operating temperature	Ohm/km	0.168	63
	corresponding to specified maximum operating current			
	(minimum 1050 A under maximum ambient conditions and zero wind			
	as per Technical Specification)at180°C(as per TS)			
8.9	Details of Creep characteristic for conductor enclosed (as per	Yes/No	Yes	;
	Technical Specification)			
8.1	Sag Tension Calculation (233m Span)			
3.10.1	Sag Tension Calculation enclosed	Yes/No	Yes	5
3.10.2	Sag & tension at 32 deg. C & no wind	Meters & KN	2.90 /	19.212
3.10.3	Sag & tension at 32 deg. C & full wind	Meters & KN	3.69 / 2	24.403
.10.4	Sag & tension at 05 deg. C & 2/3 rd wind	Meters & KN	2.65 / 2	7.570
.10.5		Meters & KN	3.25 / 1	7.145
.10.6	Sag & tension at 150 deg. C & no wind Meters & KN	Meters & KN	3.34 / 1	6.668
.10.7	Sag & tension at maximum operating temperature 180 deg. C & no	Meters & KN	3.37 / 1	6.506
	wind			
.10.8	Sag & tension at emergency temperature & no wind	Meters & KN	3.40 / 1	6.394
8.11	Tolerance on standard length of conductor	%	± 59	%
3.12	Direction of lay for outside layer		Right H	land
3.13	Linear mass of the Conductor			
	a) Standard	Kg/Km	834.	4
	b) Minimum	Kg/Km	822	2
	c) Maximum	Kg/Km	847	,
.14	Standard length of conductor	KM	2.4	
.00	Drum is as per specification	Yes/No	Yes	
0.0	Accessories as per specification/standards	Yes/No	Yes	

Date: 03.10.2023

(Signature).....

Place: (Printed Name) - S.K. AGARWAL (Designation) - Sr. Vice President (Marketing)

(Common Seal).....

APPROVED

Subject to the condition that you are not absolved or the responsibility for correctness of the materials supplied a per specification

Electrical Supering Ling Engineering (Planning and Engineering Bihar State Power Transmission Company and Vidyut Bhawan, Patha-School

8 001 2023







APAR INDUSTRIES LIMITED CONDUCTORS DIVISON

Marketing & Registered office: 301, Panorama Complex, RC Dutt Road, Vadodara, Gujarat,India

390 007. CLIENT: BIHAR STATE POWER TRANSMISSION COMPANY LTD.

CONTRACTOR: APAR INDUSTRIES LIMITED

PROJECT: Supply contract for design, manufacture, testing at manufacture's works and delivery of equipment's required for Re-conductroring work of 06 Nos. 132kV Transmission Line with HTLS equivalent to ACSR Panther Conductor: (i) 132 KV Motihari (DMTCL). Bettiah DCDS T/L (ii) 132 KV Musahari-Sitamarhi DCDS T/L (iii) 132 KV Motipur-Motihari DCSS T/L (iv) 132 KV Supaul -Nirmali DCSS T/L (v) 132 KV Supaul -Phulparas DCSS T/L (vi) 132 KV Phulparas - Nirmali DCSS T/L on turnkey basis under special assistance to states for capital investment for 2023-24 against NIT No. 18/PR/BSPTCL/2023.

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GUARANTEED TECHNICAL PARTICULARS OF "ACCC HTLS" (EQUIVALENT TO PANTHER) "

CONL	DUCTOR		
61	For Span 305 meters		
SI	Description	Unit	Value guaranteed by the Bidder
1	Name of Manufacturer		APAR INDUSTRIES LTD
2	Address of Manufacturer		INDIA
3	Name of the conductor		ACCC CASABLANCA
4	Construction of conductor/ Designation of conductor as per		An.Al.12/4.25mm (TW) +
	IEC:61089		An.Al. 8/4.06mm (TW) +
			composite core 1/7.11 mm (R)
5	Particulars of Raw Material		
5.1	Outer Layers		
	a) Type of conductor strand.		1350 O-tempered aluminum as per
			ASTM B233, ASTM B 609
	b) Chemical composition of Conductor strand .		
	i) Al.	%	99.50 (min)
	ii) si APPROVED	%	0.10 (max)
	iii) Fe	%	0.40 (max)
	iii) Fe iv) Cu Subject to the condition that you are not absolved of	%	0.04 (max)
	iv) Cu Subject to the control of the materials the responsibility for correctness of the materials the responsibility for correctness of the materials	%	0.02 (max)
	v) Ti + Va the responsibility of the vi) Mn supplied as per specification	%	0.01 (max)
	vii) Zr	%	0.01 (max)
		%	0.01 (max)
5.2	Electronia Stimming Ling Ling Ling		
	Inner Core a) Material of core (Planning and Engineering) imited	1	Hybrid carbon and glass fiber
	Dibar Chale Downer (12/15/115/115/10)		composite core as per ASTM B987
	Vidyut Bhawan, Patna-800021		
	b) Chemical composition of core		
	0 11 8 OCT 2023	%	-
		%	-
	iii) ——	%	-
	iv) — 🏲	%	-
	V	%	-
	vi) —-	%	-
6	Outer Aluminium / Aluminium Alloy Strand after Stranding		_
6.1	Number of outer layers	Nos.	2
6.2	Diameter		Layer 1 / Layer 2
	a) Nominal	mm	4.06mm (TW) / 4.25mm (TW)
	b) Maximum	mm	4.10mm (TW) / 4.29mm (TW)
	c) Minimum	mm	4.02mm (TW) / 4.21mm (TW)
6.3	Minimum Breaking load of strand		
	a) Before stranding	KN	0.777 / 0.851
	b) After stranding	KN	0.738 / 0.809
6.4	Resistance of 1m length of strand at 20 deg. C	Ohm	0.002156 / 0.001965
7	Inner core strands/inner core after stranding		
7.1	Number of layers in inner core	No	1
7.2	Diameter		
	a) Nominal	mm	7.11
	b) Maximum	mm	7.16
	c) Minimum	mm	7.06
7.3	Minimum Breaking load of strand/Core		
	a) Before stranding	KN	85.0
	b) After stranding	KN	85.0

7.4	Min. no. of twists which a single strand shall withstand during torsion	Nos.	Not Ap	plicable
7.4	test for a length equal to 100times dia of wire after stranding.			
	101 101 0 101/9/1 - 4			
8	Complete conductor		100	0.4
8.1	UTS of Conductor	KN	Maximum	Minimum
8.2	Lay ratio of conductor (As per ASTM B857)		13	10
	a) 1 st layer (outer most layer)		16	10
	b) 2nd Layer		10	10
	c) 3rd Layer			
	d) 4th Layer	_	16	
8.3	Maximum permissible conductor temperature for continuous operation	Deg C	18	30
8.4	Maximum permissible conductor temperature for short term operation	Deg C	20	00
				•
8.5	Permissible duration of above short term operation	Minutes		0
8.6	Maximum length of conductor that can be offered as single length	KM	2	.5
8.7	DC resistance of conductor at 20°C	Ohm/km	0.1	024
8.8	AC resistance at maximum continuous operating temperature	Ohm/km	0.16	863
	corresponding to specified maximum operating current			
	(minimum 1050 A under maximum ambient conditions and zero wind			
	as per Technical Specification)at180°C(as per TS)			
8.9	Details of Creep characteristic for conductor enclosed (as per	Yes/No	Υ	es
	Technical Specification)			
8.1	Sag Tension Calculation (305m Span)			
8.10.1	Sag Tension Calculation enclosed	Yes/No	Υ	es
8.10.2	Sag & tension at 32 deg. C & no wind	Meters & KN	4.33 /	22.030
8.10.3	Sag & tension at 32 deg. C & full wind	Meters & KN	5.45 /	28.407
8.10.4		Meters & KN	4.47 /	28.017
8.10.5		Meters & KN	5.36	′ 17.811
8.10.6		Meters & KN	5.49 /	17.383
8.10.7		Meters & KN	5.54 /	17.238
	wind			
8.10.8	Sag & tension at emergency temperature & no wind	Meters & KN	5.57 /	17.137
8.11	Tolerance on standard length of conductor	%	±	5%
8.12	Direction of lay for outside layer		Right	Hand
8.13	Linear mass of the Conductor		Ü	
	a) Standard	Kg/Km	83	4.4
	b) Minimum	Kg/Km	8	22
	c) Maximum	Kg/Km	8	47
8.14	Standard length of conductor	KM	2	.4
9.00	Drum is as per specification	Yes/No	Υ	es
10.0	Accessories as per specification/standards	Yes/No	Υ	es

Date: 03.10.2023

(Signature).....

Place: (Printed Name) - S.K. AGARWAL (Designation) - Sr. Vice President (Marketing)

227

(Common Seal).....



"Subject to the condition that you are not absolved of the responsibility for correctness of the materials

supplied as per specification

Electrical Superintending Engineer (Planning and Engineering)

18 OCT Ribar State Power Transmission Company Limited 2023/ridyur Bhawan, Patna-800021

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APAR INDUSTRIES LIMITED CONDUCTORS DIVISON

Marketing & Registered office: 301, Panorama Complex,

RC Dutt Road, Vadodara, Gujarat,India

CLIENT: BIHAR STATE POWER TRANSMISSION COMPANY LTD.

CONTRACTOR: APAR INDUSTRIES LIMITED

PROJECT : Supply contract for design, menufacture, testing at manufacture's works and delivery of equipment's required for Re-conductroring work of 06 Nos. 132kV Transmission Line with HTLS equivalent to ACSR Panther Conductor: (i) 132 KV Motheri (DMTCL). Bettleh DCDS T/L (ii) 132 KV Musahari-Sitamarhi DCDS T/L (iii) 132 KV Motipur-Motihari DCSS T/L (iv) 132 KV Supaul -Nirmali DCSS T/L (v) 132 KV Supaul -Phulparas DCSS T/L (vi) 132 KV Phulparas - Nirmali DCSS T/L on turnkey basis under special assistance to states for capital investment for 2023-24 against NIT No. 18/PR/BSPTCL/2023.

NOA No.: 14-Trans/Misc/P-I/33/2023 Dated: 22.09.2023 & 15-Trans/Misc/P-I/33/2023 Dated: 22.09.2023

GUARANTEED TECHNICAL PARTICULARS OF "ACCC HTLS" (EQUIVALENT TO PANTHER) "

	ANTEED TECHNICAL PARTICULARS OF "A	CCC HILS" (EQUIV	ALENT TO PANTHER) "
CON	DUCTOR		
	For Span 365 meters		
SI	Description	Unit	Value guaranteed by the Bidder
1	Name of Manufacturer		APAR INDUSTRIES LTD
2	Address of Manufacturer		INDIA
3	Name of the conductor		ACCC CASABLANCA
4	Construction of conductor/ Designation of conductor	or as per	An.Al.12/4.25mm (TW) +
	IEC:61089		An.Al. 8/4.06mm (TW) +
_			composite core 1/7.11 mm (R)
5	Particulars of Raw Material		
5.1	Outer Layers		
	a) Type of conductor strand.		1350 O-tempered aluminum as per
			ASTM B233, ASTM B 609
	b) Chemical composition of Conductor strand .		
	i) Al.	%	99.50 (min)
	ii) Si		0.10 (max)
	ii) Fe APPROV	/ヒレ 。	0.40 (max)
	iv) Cu	are not absorved w	0.04 (max)
	v) Ti + Va Subject to the contration that you will Mn the responsibility for correctness	ss of the materials	0.02 (max)
	vi) Mn the responsibility to curves a supplied as per spe	ecification %	0.01 (max)
	vii) Zr supplied as possible	%	0.01 (max)
	viii) Cr KW	%	0.01 (max)
5.2	Inner Core a) Material of core	ine Engineer	5.51 (max)
			Hybrid carbon and glass fiber composite
	Bihar State Power Transmission	on Company Limited	core as per ASTM B987
	b) Chemical composition of core idyut Bhowan, Pa	ma-200021	200 00 00000000000000000000000000000000
	i) — Signatura Signatura i, i	%	
	M.E.	h %	-
	11 8 OCT 2023	*** %	-
	iv)	% %	-
	v) ——	%	-
	vi) —	% %	-
6	Outer Aluminium / Aluminium Alloy Strand after Stranding	76	-
6.1	Number of outer layers	Nos.	2
6.2	Diameter	1103.	Layer 1 / Layer 2
	a) Nominal	mm	4.06mm (TW) / 4.25mm (TW)
	b) Maximum	mm	4.10mm (TW) / 4.29mm (TW)
	c) Minimum	mm	4.02mm (TW) / 4.21mm (TW)
6.3	Minimum Breaking load of strand		(144)
	a) Before stranding	KN	0.777 / 0.851
	b) After stranding	KN	0.738 / 0.809
6.4	Resistance of 1m length of strand at 20 deg. C	Ohm	0.002156 / 0.001965
7	Inner core strands/inner core after stranding		, 2,32,733
7.1	Number of layers in inner core	No	1
7.2	Diameter		·
	a) Nominal	mm	7.11
	b) Maximum	mm	7.16
	c) Minimum	mm	7.06
7.3	Minimum Breaking load of strand/Core		
	a) Before stranding	KN	85.0
	b) After stranding	KN	85.0
	CTD		40.0

7.4	Min. no. of twists which a single strand shall withstand during torsion test for a length equal to 100times dia of wire after stranding.	Nos.	Not Ap	plicable
8	Complete conductor			
8.1	UTS of Conductor	KN	100	0.4
8.2	Lay ratio of conductor (As per ASTM B857)		Maximum	Minimum
	a) 1 st layer (outer most layer)		13	10
	b) 2nd Layer		16	10
	c) 3rd Layer			-
	d) 4th Layer			-
8.3	Maximum permissible conductor temperature for continuous operation	Deg C	18	30
8.4	Maximum permissible conductor temperature for short term operation	Deg C	20	00
8.5	Permissible duration of above short term operation	Minutes	3	0
8.6	Maximum length of conductor that can be offered as single length	KM	2	.5
8.7	DC resistance of conductor at 20°C	Ohm/km	0.1	024
8.8	AC resistance at maximum continuous operating temperature	Ohm/km	0.10	5863
	corresponding to specified maximum operating current			
	(minimum 1050 A under maximum ambient conditions and zero wind			
	as per Technical Specification)at180°C(as per TS)			
8.9	Details of Creep characteristic for conductor enclosed (as per	Yes/No	Y	es
	Technical Specification)			
8.1	Sag Tension Calculation (365m Span)			
8.10.1	Sag Tension Calculation enclosed	Yes/No	Y	es
8.10.2	Sag & tension at 32 deg. C & no wind	Meters & KN	6.26 /	21.850
8.10.3	Sag & tension at 32 deg. C & full wind	Meters & KN	7.58 /	29.286
8.10.4	Sag & tension at 05 deg. C & 2/3 rd wind	Meters & KN	6.32 /	28.400
8.10.5	Sag & tension at 65 deg. C & no wind	Meters & KN	7.45	′ 18.365
8.10.6	Sag & tension at 150 deg. C & no wind Meters & KN	Meters & KN	7.61 /	17.976
8.10.7	Sag & tension at maximum operating temperature 180 deg. C & no wind	Meters & KN	7.67 /	17.841
8.10.8	Sag & tension at emergency temperature & no wind	Meters & KN	7.71 /	17.750
8.11	Tolerance on standard length of conductor	%	±	5%
8.12	Direction of lay for outside layer		Righ	t Hand
8.13	Linear mass of the Conductor			
	a) Standard	Kg/Km	83	34.4
	b) Minimum	Kg/Km	8	322
	c) Maximum	Kg/Km	8	347
8.14	Standard length of conductor	KM	:	2.4
9.00	Drum is as per specification	Yes/No	,	res es
10.0	Accessories as per specification/standards	Yes/No	,	res es

Date: 03.10.2023

(Signature).....

Place: (Printed Name) - S.K. AGARWAL (Designation) - Sr. Vice President (Marketing)

(Common Seal).....

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APPROVED

Subject to the condition that you are not absolve. the responsibility for correctness of the materials supplied as pr specification

Electrical Superimending Engineer
Planning and Engineering)
Transmission Company Limited

Vioyut Bhawar, Patha-800021

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PROJECT: Supply contract for design, manufacture, testing at manufacture's works and delivery of equipment's required for Reconductoring of 06 Nos. Subject to the condition that you are not absolved O'LIENT: BIHAR STATE POWER TRANSMISSION COMPANY LIMITED Hybrid Carbon and glass fiber Composite core 132kV Transmission lines with HTLS equivalent to ACSR Panther rapezoidal Shaped Annealed Al.Wire Trapezoidal Shaped Annealed Al.Wire Diameter Equi. Round wire = 4.25mm Diameter Equi. Round wire = 4.06mm NOA NO. 14-Trans/Misc/P-I/33/2023 Dated: 22.09.2023 & 15-Trans/Misc/P-I/33/2023 Dated: 22.09.2023 CROSS SECTIONAL DRAWING: CONCENTRIC LAY STRANDED CONDUCTOR the responsibility for correctness of the material CONTRACTOR: APAR INDUSTRIES LIMITED Diameter = 7.11 mm Electrical Superintending Enginee NIT No. 18/PR/BSPTCL/2023 Nos. =12 Nos. =08 Bihar State Power Transmission Company Liv Vidyfut Bhawan, Patna-800021 supplied (a) per specification (Planning and Engineering) APPROVED 20.50

CODE NAME: ACCC CASABLANCA

TITLE

STRIE S

DDS-05.10.2020 PA - 05.10.2020

DRN

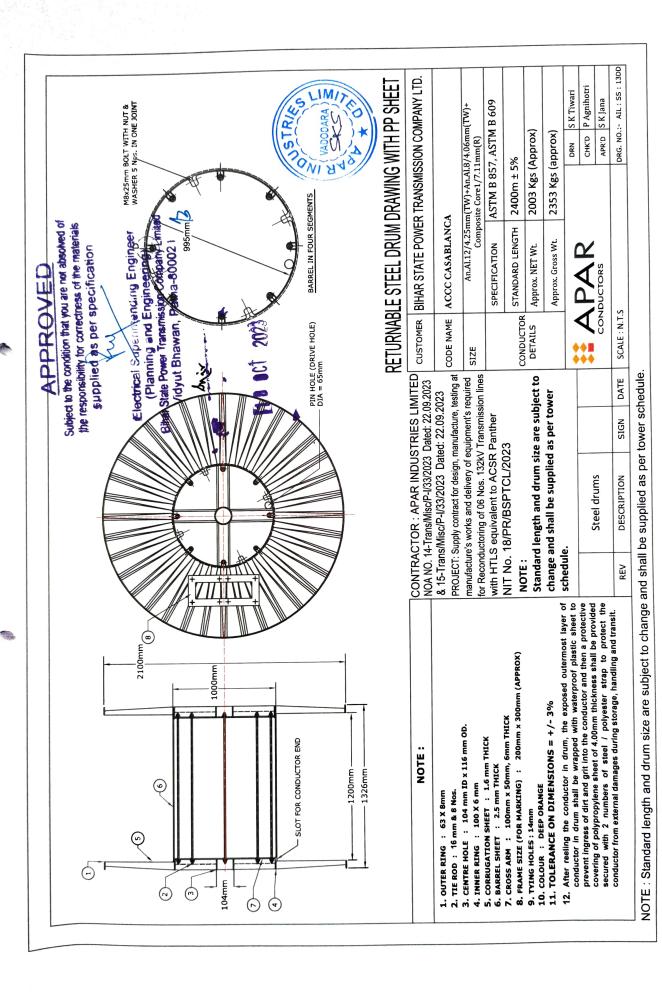
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SKJ - 05.10.2020 APR'D SCALE fomorrow's solutions today

DRG. NO. . AIL:CSD:ACCC : TW

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STANDARD MANUFACTURING QUALITY PLAN

CLIENT	Bihar State Power Transmission Corporation Ltd.			
CONTRACTOR	APAR INDUSTRIES LIMITED			
NOA No.	14-Trans/Misc/P-I/33/2023 Dated: 22.09.2023			
	& 15-Trans/Misc/P-I/33/2023 Dated: 22.09.2023			
Project Name	Supply contract for design, manufacture, testing at manufacture's works and delivery of equipment's required for Reconductoring of 06 Nos. 132kV Transmission lines with HTLS equivalent to ACSR Panther, NIT No. 18/PR/BSPTCL/2023			
Code Name	ACCC CASABLANCA			
Size / Construction	An.Al.12/4.25mm (TW) + An. Al. 8/4.06mm (TW) +			
	Composite core 1/7.11 mm (R)			

SECTION: (A) PROCUREMENT OF RAW MATERIALS & INSPECTION: 1.0 ALUMINIUM WIRE ROD (Continuously Casted and Rolled)

SR. NO	COMPONENTS / OPERATION & DESCRIPTION OF TEST	SAMPLING PLAN BASIS		REF. DOCUMENT ACCEPTANCE NORMS	TESTING AGENCY	REMARKS
1.1	Chemical Analysis	1 sample per heat	Vanadio Other e	ASTM B 233 Silicon = 0.10 max Iron = 0.40 max Copper = 0.04 max anganese = 0.01 max hromium = 0.01 max Zinc = 0.05 max Boron = 0.05 max Gallium = 0.03 max um + titanium, total = 0.02 max elements, each = 0.03 max elements, total = 0.10 max luminum = 99.50min	the respo	Review of records of the contractor at the time of final inspection. PROVED The condition that you are not absolved of installity for correctness of the materials opplied as per specification rical Superintending Engineering: Planning and Engineering: ate Power Transmission Comparis dyut Bhawan, Patna-8000.
1.2	Diameter	1 Sample from each coil.	Nom Min. Max.	9.50 mm 9.00 mm	upplier of wire rod	Review of records of the contractor at the time of final inspection.
1.3	Tensile Strength	1 Sample from each coil.		TS 5 to 125 N/mm² (Min)	Supplier of wire rod	Review of records of the contractor at the time of final inspection.
1.4	Elongation	1 Sample from each coil.	8% o	n 250 mm gauge length.	Supplier of wire rod	Review of records of the contractor at the time of final inspection.
1.5	Resistivity & Conductivity	1 Sample from each coil.	28.264 Ωmm²/km at 20°C.		Supplier of wire rod	Review of records of the contractor at the time of final inspection.
1.6	Cleanliness and surface smoothness (visual Check)	100% on each coil.	free kink injurio	re rod shall be smooth and from pipes laps, cracks, s, twists, scams & other us defects within the limits and commercial practice.	Supplier of wire rod	Review of records of the contractor at the time of final inspection.

Prepared by: Aritra Mukherjee

Reviewed by & Issued by: Pradeep Agnihotri



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CONTRACTOR	APAR INDUSTRIES LIMITED
NOA No.	14-Trans/Misc/P-I/33/2023 Dated: 22.09.2023
	& 15-Trans/Misc/P-I/33/2023 Dated: 22.09.2023
Project Name	Supply contract for design, manufacture, testing at manufacture's works and delivery of equipment's required for Reconductoring of 06 Nos. 132kV Transmission lines with HTLS equivalent to ACSR Panther, NIT No. 18/PR/BSPTCL/2023
Code Name	ACCC CASABLANCA
Size / Construction	An.Al.12/4.25mm (TW) + An. Al. 8/4.06mm (TW) +
	Composite core 1/7.11 mm (R)

SR. NO	COMPONENTS / OPERATION & DESCRIPTION OF TEST	SAMPLING PLAN BASIS	REF. DOCUMENT AND ACCEPTANCE NORMS	TESTING AGENCY	REMARKS
2.1	Diameter of composite core	5% of the batch	Min : 7.06mm Max : 7.16mm Nom : 7.11mm	Supplier of core	Review of records of the contractor at the time of final inspection.
2.2	Breaking load / Tensile Test	5% of the batch	Min. 85.0KN	Supplier of core	Review of records of the contractor at the time of final inspection.
2.3	Surface Smoothness	100% of the entire batch	Surface shall be free from all imperfections such as nicks, indentations etc Not consistent with good commercial practice.	Supplier of core	Review of records of the contractor at the time of final inspection.

SECTION (B): INPROCESS INSPECTION

3. Annealed Aluminium Trapezoidal drawn wire.

SR. NO	COMPONENTS / OPERATION & DESCRIPTION OF TEST	SAMPLING PLAN BASIS	REF. DOCUMENT AND ACCEPTANCE NORMS	TESTING AGENCY	REMARKS
3.1	Surface Finish (Visual Check)	100% on each spool	ASTM 609 The wire shall be smooth, uniform & free from all imperfections such as spills, splits, scale, inclusion, die marks, scratches, at a more states.	QC Dept. of the contractor	Review of records of the contractor at the time of final inspection:

Subject to the condition that you are not absolved of the responsibility for correctness of the materials supplied per specification

Electrical Supering Engineer (Planning and Engineering)

(Planning and Engineering)

Bihar Flate Power Transmission Company Limited

Vidyut Bhawan, Patna-800021 Reviewed by & Issued by: Pradeep Agnihotri Snir

Prepared by: Aritra Mukherjee



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CONTRACTOR	APAR INDUSTRIES LIMITED		
NOA No.	14-Trans/Misc/P-I/33/2023 Dated: 22.09.2023		
	& 15-Trans/Misc/P-I/33/2023 Dated: 22.09.2023		
Project Name	Supply contract for design, manufacture, testing at manufacture's works and delivery of equipment's required for Reconductoring of 06 Nos. 132kV Transmission lines with HTLS equivalent to ACSR Panther, NIT No. 18/PR/BSPTCL/2023		
Code Name	ACCC CASABLANCA		
Size / Construction	An.Al.12/4.25mm (TW) + An. Al. 8/4.06mm (TW) +		
	Composite core 1/7.11 mm (R)		

SR. NO	COMPONENTS / OPERATION & DESCRIPTION OF TEST	SAMPLING PLAN BASIS	REF. DO	CUMENT ANCE NORMS	TESTING AGENCY	REMARKS
3.2	Cross sectional area of Aluminium wire	One sample per 10 spools	Customer S 1st la Nom : 12 (eq. to 4.06m 2nd La Nom : 14 (eq. to 4.25m) Tolerance on	yer: .946mm² m round wire) ayer: .186mm² m round wire)	Subject to the co the responsibility supplie	Review of records of the contractor at the contr
3.3	Breaking Load/Tensile Test	One sample per 10 spools	ASTM Min-0.777 KN 4.06 Min-0.851 KN 4.25	N for wire of omm \(\frac{1}{2} \) N for wire of	ac Deplement the State Por Vidyut	Supernitanding Engineer hiReviand Engineering contractor at whatenession Generally Limiter Bhawan, Patna-800021
3.4	% Elongation	One sample per 10 spools	ASTM Min.20% on gu 250i	uage length of	QC Dept. of the contractor	Review of records of the contractor at the time of final inspection.
3.5	Wrapping test	One sample per 10 spools	8 wraps, 6 unwra the wire The wire shall no any cr	itself. t break or show	QC Dept. of the contractor	Review of records of the contractor at the time of final inspection.
3.6	Resistance @ 20°C	One sample per 10 spools	Approve Max.2.156 Ω/km for 4.06mm wire	Max.1.965 Ω/km for 4.25mm wire	QC Dept. of the contractor	Review of records of the contractor at the time of final inspection.

SECTION (B): INPROCESS INSPECTION

(4) FINAL CONDUCTOR STRANDING:

SR. NO	COMPONENTS / OPERATION & DESCRIPTION OF TEST	SAMPLING PLAN BASIS	1	REF. DO		NT NORMS	TESTING AGENCY	REMARKS
4.1	Lay ratio/ Direction & Compactness	One sample at the beginning of each setup	LAYER AI 8 (TW) AI.12	ASTA MIN 10	MAX. 16	DIR.	QC Dept. of contractor.	Review of records of the contractor at the time of final inspection.

Prepared by: Aritra Mukherjee

Reviewed by & Issued by: Pradeep Agnihotri



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Code Name	ACCC CASABLANCA
Size / Construction	An.Al.12/4.25mm (TW) + An. Al. 8/4.06mm (TW) +
-	Composite core 1/7.11 mm (R)

SR. NO	COMPONENTS / OPERATION & DESCRIPTION OF TEST	SAMPLING PLAN BASIS	REF. DOCUMENT AND ACCEPTANCE NORMS	TESTING AGENCY	REMARKS
4.2	Surface Smoothness/ Scratches (Visual Check)	100%	APAR Specification : The finished conductor shall be smooth, compact, uniform and free from all imperfections.	QC Dept. of contractor.	Review of records of the contractor at the time of final inspection.
4.3	Joints (Visual Check)	100%	APAR Specification: There shall be no joints on the outer most layer. Joints are allowed in inner layers but no two such joints shall be less than 15 metres apart in completed conductor.	the resp	Review of records of the contractor at the time of the condition that you are not absolved to provide the condition that you are not absolved to provide the condition that you are not absolved to provide the condition that you are not absolved to provide the condition that you are not absolved to provide the condition that you are not absolved to provide the contractor at the condition that you are not absolved to provide the condition that you are not absolved

SECTION (C): FINAL INSPECTION AND TESTING (ROUTINE & ACCEPTANCE TEST ON FINAL 80002 TO CONDUCTOR)

(6) POUTINE TESTS:

(E) POLITINE TESTS.

SR. NO	COMPONENTS / OPERATION & DESCRIPTION OF TEST	SAMPLING PLAN BASIS		. DOCUM CEPTANC	IENT E NORMS	TESTING AGENCY	REMARKS
5.1	All tests as per clause 6.1 to 6.6 as under	10% of the drums.	ASTM B 609 APAR Speci	•	857 and	QC Dept. of Contractor.	Review of records of contractor a the time of final Inspection.
Α	Acceptance tests on	Finished C	 onductor:				
6.1	Lay ratio	One sample	A	STM B 8	57	QC Dept. of	Inspection at works
6.1	Lay ratio	for every 10	LAYER		57 MAX.	QC Dept. of Contractor.	Inspection at works
6.1	Lay ratio	· ·		STM B 8			Inspection at works
6.1	Lay ratio	for every 10 drums or	LAYER	STM B 8	MAX.		Inspection at works

Prepared by: Aritra Mukherjee Reviewed by & Issued by: Pradeep Agnihotri



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Code Name	ACCC CASABLANCA
Size / Construction	An.Al.12/4.25mm (TW) + An. Al. 8/4.06mm (TW) +
-	Composite core 1/7.11 mm (R)

В	Annealed Aluminium	n Trapezoid	lal drawn wir	e (After Strand	ding)	
SR. NO	COMPONENTS / OPERATION & DESCRIPTION OF TEST	SAMPLING PLAN BASIS		CUMENT ANCE NORMS	TESTING AGENCY	REMARKS
6.2	Total Cross sectional area of Aluminium wire	10% of the drums		1 B 857 nm ² ± 2%	QC Dept. of contractor	Inspection at works
6.3	Breaking Load/Tensile Test	10% of the drums	Min-0.738 KN fo	N B 609 or wire of 4.06mm or wire of 4.25mm	QC Dept. of contractor	Inspection at works
6.4	% Elongation	10% of the drums	Min.20% on g	IB 609 guage length of Omm	QC Dept. of contractor	Inspection at works
6.5	Wrapping test	10% of the drums	the wi The wire shall n	rap & 8 wraps on re itself. ot break or show crack.	QC Dept. of contractor	Inspection at works
6.6	DC Resistance @ 20°C (Conductivity Test)	10% of the drums	Max.2.156 Ω/km for 4.06mm wire	Max.1.965 Ω/km for 4.25mm wire	QC Dept. of contractor	Inspection at works

7	LENGTH MEASUREA	MENT OF F	INISHED CONDUCTOR		
7.1	Check for joints, surface finish & length measurement by rewinding.	5% of the drums	Conductor length as per packing list and marking on drum	Visual check & length measurement by rewinding as per packing list.	Inspection at works



18 OCT 2023

Prepared by: Aritra Mukherjee **APPROVED**

the responsibility for correctness of the materials supplied as ne specification

Electrical Supering Engineer
(Planning and Engineering)

Binar State Power Transmission Company Limited
Vidyut Bhawan, Patna-800021

Reviewed by & Issued by: Pradeep Agnihotri



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Code Name	ACCC CASABLANCA
Size / Construction	An.Al.12/4.25mm (TW) + An. Al. 8/4.06mm (TW) +
***	Composite core 1/7.11 mm (R)

SR. NO	COMPONENTS / OPERATION & DESCRIPTION OF TEST	SAMPLING PLAN BASIS	REF. DOCUMENT AND ACCEPTANCE NORMS	TESTING AGENCY	REMARKS
C	PACKING AND DISP	PATCH			
8	Check for Identificati	ion and Pac	kina.		
8.1	Contract/ Award Letter no.		.		
8.2	Manufacturer's Name & Address				
8.3	Drum No.	1			
8.4	Size & Code name of Conductor				
8.5	Length of Conductor	1			
8.6	Gross Weight of Drum after lagging.				
8.7	Tare Weight without Lagging	1			
8.8	Net Weight of Conductor in the drum.				
8.9	Arrow Marking for unwinding				
8.10	Position of conductor ends.	1			
8.11	Name & Address of consignee	100%	-	QC Department of	-
				Contractor	

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Subject to the condition that you are not absolved of the responsibility for correctness of the materials supplied as no agentification

Electrical Superiors among Engine (Proming and Engineering binar State Power Transmission Company Connect Vidyut Bhawan, Patna-800021

18 OCT 2023

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VADODARA) MANA CHARACTER CONTROL OF A CHARACT

Prepared by: Aritra Mukherjee Reviewed by & Issued by: Pradeep Agnihotri