CPRI

TEST REPORT

Central Power Research Institute

(A Govt.of India Society,)
P.B. No.8066, Sadashivanagar Post Office
Prof. Sir.C.V. Raman Road,
Bangalore - 560 080(INDIA)

CENTRAL POWER RESEARCH INSTITUTE

CPRI

TEST REPORT

Test Report Number	:	CPRIBLRCAB19T0028	Dated : 12.02.2019
Name and Address of the Customer	:	M/s. National Cable Industry, Al Sajja, Industrial Area, Al Dhaid Road, Near Sharjah Cement Factory, Sharjah, UAE	
Name and Address of the Manufacturer	:	M/s. National Cable Industry, Al Sajja, Industrial Area, Al Dhaid Road, Near Sharjah Cement Factory, Sharjah, UAE	
Particulars of Sample Tested	:	0.6/1.0kV, 4C x 185 sq.mm AL/XLPE/PVC/SWA/PVC cable	
		Conductor	Sector shaped Stranded plain Aluminium
		Size	185 sq.mm
		Insulation	XLPE
		No. of cores	Four
		Inner sheath	PVC, Type ST2
		Armour	Galvanised Steel round wire
		Outer sheath	PVC, Type ST2
		Rated voltage	600 / 1000 V
		Embossing: DEWA ELECTRIC CABLE 600/1000V 4 X 185 MM² AL/XLPE/PVC/SWA/PVC IEC 60502-1 NATIONAL CABLES INDUSTRY, UAE PO: 3411800488 (2018)	
Condition of sample on receipt	:	New	
Type	:	AL/XLPE/PVC/SWA/PVC 0.6/1 kV	
Description of test sample	:	0.6/1.0, 4C x 185 sq.mm AL/XLPE/PVC/SWA/PVC cable	
Serial Number	:	Nil	
Number of Samples tested	:	One only	
Date(s)of test(s)	:	21.01.2019 – 11.02.2019	
CPRI sample Code Number	:	CDDCAB19S0011	
Particulars of tests conducted	:	Type test	
Test in accordance with Standard/ Specification	:	As per IEC-60502- Part 1 : 2004 with amendment 1 : 2009 and DEWA Specification	
Sampling Plan	:	Nil	
Customer's requirement	:	Nil	
Deviation, if any	:	Nil	
Name of the witnessing persons			
Customer's representative	:	Mr. Shahbaz Rawal	
Other than Customer's representative	:	Mr. Humaid Alshamsi, DEWA	
Test subcontracted with address of the laboratory	:	None	
Document constituting this report (in words)			
Number of pages	:	Ten	
Number of oscillograms	:	Nil	
Number of graphs	:	Nil	
Number of photos	:	Nil	
Number of test circuit diagrams	:	Nil	
Number of drawings	:	One (Drawing No. NCI–4x185-1kV-3411800488)	

(P.V.SATHEESH KUMAR)
TEST ENGINEER

(K.P.MEENA)
JOINT DIRECTOR
Approved by

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1.0. TEST ON CONDUCTOR:

1.1. CONDUCTOR RESISTANCE TEST:

Sl. No.	Identification	Resistance, Ω/km at 20⁰ C	
		Observed values	Specified value (Maximum)
1	Red	0.155	0.164
2	Yellow	0.158	
3	Blue	0.155	
4	Black	0.151	

1.2. CONDUCTOR EXAMINATION:

Sl. No.	Identification	Number of wires	
		Observed	Specified (Minimum)
1	Red	37	37
2	Yellow	37	
3	Blue	37	
4	Black	37	

2.0. TESTS ON INSULATION:

2.1. TEST FOR THICKNESS OF INSULATION:

Sl. No.	Identification	Observed, mm		Specified, mm	
		Minimum	Average	Minimum	Average
1	Red	1.78	2.20	1.34	1.60
2	Yellow	1.71	2.15		
3	Blue	1.96	2.11		
4	Black	1.96	2.28		

2.2. TENSILE STRENGTH AND ELONGATION AT BREAK

2.2.1. BEFORE AGEING:

Sl. No.	Identification	Observed		Specified (Minimum)	
		Tensile strength, N/mm²	Elongation at break, %	Tensile strength, N/mm²	Elongation at break,%
1	Red	20.21	549.00	12.5	200
2	Yellow	21.68	554.00		
3	Blue	18.61	472.00		
4	Black	22.30	521.00		

2.2.2. AGEING:

Sample	Temperature	Duration
Dumb- bell Specimens	135±3⁰ C	168 Hours

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2.2.3. AFTER AGEING:

Sl. No.	Identification	Observed	
		Tensile strength, N/mm²	Elongation at break, %
1	Red	18.34	465.00
2	Yellow	19.31	495.00
3	Blue	19.80	482.00
4	Black	21.11	462.00

2.2.4. VARIATION OBSERVED FROM BEFORE AGEING SAMPLES:

Sl. No.	Identification	Observed variation, %		Specified variations, (Maximum)	
		Tensile strength	Elongation at break	Tensile strength	Elongation at break
1	Red	-9.25	-15.30	± 25	± 25
2	Yellow	-10.93	-10.65		
3	Blue	6.39	2.12		
4	Black	-5.34	-11.32		

2.2.5. COMPLETE CABLE AGEING:

Sample	Temperature	Duration
200 mm of Complete cable	100±2⁰ C	168 Hours

2.2.6. AFTER COMPLETE CABLE AGEING:

Sl. No.	Identification	Observed	
		Tensile strength, N/mm²	Elongation at break, %
1	Red	21.08	509.00
2	Yellow	20.88	486.00
3	Blue	15.86	514.00
4	Black	24.38	558.00

2.2.7. VARIATION OBSERVED FROM BEFORE AGEING SAMPLE:

Sl. No.	Identification	Observed variation, %		Specified variations, % (Maximum)	
		Tensile strength	Elongation at break	Tensile strength	Elongation at break
1	Red	4.30	-7.29	± 25	± 25
2	Yellow	-3.69	-12.27		
3	Blue	-14.78	8.90		
4	Black	9.33	7.10		

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2.3. WATER ABSORPTION TEST: (GRAVIMETRIC)

Treatment	Temperature	Duration
	85 ± 2 ° C	14 days

Sl. No.	Identification	Water absorbed, mg/cm²	
		Observed, mm	Specified (Maximum)
1	Red	0.06	1.0
2	Yellow	0.06	
3	Blue	0.07	
4	Black	0.08	

2.4. SHRINKAGE TEST:

Treatment	Temperature	Duration
	130 ± 3°C	1 hour

Sl. No.	Identification	Shrinkage, %	
		Observed, mm	Specified (Maximum)
1	Red	1.61	4.0
2	Yellow	1.37	
3	Blue	1.26	
4	Black	1.81	

2.5. HOT SET TEST:

Treatment	
	Temperature : 200 ± 3°C Time under load : 15 minutes Mechanical stress : 20 N/cm²

Sl. No.	Identification	Observed, %		Specified, % (Maximum)	
		Hot set elongation	Permanent set elongation	Hot set elongation	Permanent set elongation
1	Red	57.38	1.68	175	15
2	Yellow	59.00	0.57		
3	Blue	55.05	1.85		
4	Black	59.04	3.28		

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ULR – TC5452190CABT0028F

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3.0. TESTS ON OUTER SHEATH:

3.1. THICKNESS:

Observed, mm		Specified, mm	
Nominal	Minimum	Nominal	Minimum
2.88	2.77	2.80	2.04

3.2. TENSILE STRENGTH AND ELONGATION AT BREAK

3.2.1. BEFORE AGEING:

Observed		Specified (Minimum)	
Tensile strength, N/mm^2	Elongation at Break, %	Tensile strength, N/mm^2	Elongation at Break, %
16.90	181.00	12.5	150

3.2.2. AGEING:

Sample	Temperature	Duration
Dumb- bell Specimens	100 ± 2 ^{0} C	168 Hours

3.2.3. AFTER AGEING:

Observed		Specified (Minimum)	
Tensile strength, N/mm^2	Elongation at break, %	Tensile strength, N/mm^2	Elongation at break, %
16.41	192.00	12.5	150

3.2.4. VARIATION OBSERVED FROM BEFORE AGEING SAMPLE:

Observed variation, %		Specified variation, % (Maximum)	
Tensile strength	Elongation at break	Tensile strength	Elongation at break
-2.89	6.08	± 25	± 25

3.2.5. COMPLETE CABLE AGEING:

Sample	Temperature	Duration
200 mm of Complete cable	100 ± 2 ^{0} C	168 Hours

3.2.6. AFTER COMPLETE CABLE AGEING:

Observed		Specified (Minimum)	
Tensile strength, N/mm^2	Elongation at break, %	Tensile strength, N/mm^2	Elongation at break, %
17.06	189.00	12.5	150

3.2.7. VARIATION OBSERVED FROM BEFORE AGEING SAMPLE:

Observed variation, %		Specified variation, % (Maximum)	
Tensile strength	Elongation at break	Tensile strength	Elongation at break
0.95	4.42	± 25	± 25

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3.3. PRESSURE TEST AT HIGH TEMPERATURE:

Temperature	Duration
90±2⁰ C	6 Hours

Indentation, %	
Observed	Specified (Maximum)
33.90	50

3.4. COLD IMPACT TEST:

Temperature : -15±2⁰ C	Mass of hammer: 1250 gms.

Visual Examination	
Observation	Specified
No Cracks or scales observed on outer & inner surface	No signs of cracks or scales to be observed on outer & inner surface

3.5. COLD ELONGATION TEST:

Temperature	-15±2⁰ C

Observed elongation, %	Specified elongation, % (Minimum)
93.09	20.0

3.6. HEAT SHOCK TEST:

Temperature	Duration
150±2⁰ C	1 Hour

Observed	Specified
No Cracks or any other abnormalities observed	No signs of cracks or scales to be observed

3.7. FLAMMABILITY TEST:

Diameter of Cable : 59.89 mm
Time of application of flame : 240 Seconds

	Observed, mm	Specified, mm
Distance from the lower edge of the top support to the upper onset of charred portion	360	50 (Minimum)
Distance from the lower edge of the top support to the lower onset of charred portion	505	540 (Maximum)

3.8. LOSS OF MASS TEST:

Sample	Temperature	Duration	Observed, mg/cm²	Specified, mg/cm² (maximum)
Dumb-bell specimens	100 ±2⁰ C	168 hours	1.06	1.5

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4.0. TESTS ON INNER SHEATH (BEDDING):

4.1. THICKNESS:

Observed, mm (Nominal)	Specified, mm (Nominal)
1.45	1.40

4.2. TENSILE STRENGTH AND ELONGATION AT BREAK

4.2.1. BEFORE AGEING:

Observed		Specified (Minimum)	
Tensile strength, N/mm²	Elongation at Break, %	Tensile strength, N/mm²	Elongation at Break, %
17.76	244.80	12.5	150

4.2.2. AGEING:

Sample	Temperature	Duration
Dumb- bell Specimens	100 ± 2 ⁰ C	168 Hours

4.2.3. AFTER AGEING:

Observed		Specified (Minimum)	
Tensile strength, N/mm²	Elongation at break, %	Tensile strength, N/mm²	Elongation at break, %
17.33	234.00	12.5	150

4.2.4. VARIATION OBSERVED FROM BEFORE AGEING SAMPLE:

Observed variation, %		Specified variation, % (Maximum)	
Tensile strength	Elongation at break	Tensile strength	Elongation at break
-2.42	-4.41	± 25	± 25

4.2.5. COMPLETE CABLE AGEING:

Sample	Temperature	Duration
200 mm of Complete cable	100 ± 2 ⁰ C	168 Hours

4.2.6. AFTER COMPLETE CABLE AGEING:

Observed		Specified (Minimum)	
Tensile strength, N/mm²	Elongation at break, %	Tensile strength, N/mm²	Elongation at break, %
17.53	217.00	12.5	150

4.2.7. VARIATION OBSERVED FROM BEFORE AGEING SAMPLE:

Observed variation, %		Specified variation, % (Maximum)	
Tensile strength	Elongation at break	Tensile strength	Elongation at break
-1.29	-11.36	± 25	± 25

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4.3. PRESSURE TEST AT HIGH TEMPERATURE:

Temperature	Duration
90±2⁰ C	6 Hours

Indentation, %	
Observed	Specified (Maximum)
44.15	50

4.4. COLD IMPACT TEST:

Temperature : -15±2⁰ C	Mass of hammer: 1000 gms.

Visual Examination	
Observation	Specified
No Cracks or scales observed on outer & inner surface	No signs of cracks or scales to be observed on outer & inner surface

4.5. COLD ELONGATION TEST:

Temperature	-15±2⁰ C

Observed elongation, %	Specified elongation, % (Minimum)
132.70	20.0

4.6. HEAT SHOCK TEST:

Temperature	Duration
150±2⁰ C	1 Hour

Observed	Specified
No Cracks or any other abnormalities observed	No signs of cracks or scales to be observed

4.7. LOSS OF MASS TEST:

Sample	Temperature	Duration	Observed, mg/cm²	Specified, mg/cm² (maximum)
Dumb-bell specimens	100 ±2⁰ C	168 hours	1.04	1.5

5.0. TESTS ON ARMOUR (ROUND WIRE) (As per GTP & DEWA Specification)

5.1. MASS OF ZINC COATING:

Observed, g/m²	Specified , g/m² (minimum)
389	195

5.2. DC RESISTANCE:

Item	Resistance, Ω/km at 20⁰ C	
	Observed	Specified (Maximum)
Cable Armour	0.500	0.5677

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6.0. ELECTRICAL TEST:

6.1. INSULATION RESISTANCE TEST AT 90⁰ C:

Sl. No.	Identification	Observed		Specified, (Minimum)	
		IR Constant, K, MΩ-km	Volume resistivity, Ω-cm	IR Constant, K, MΩ-km	Volume resistivity, Ω-cm
1	Red	25580.4	6.98×10^{15}	3.67	1×10^{12}
2	Yellow	23315.0	6.36×10^{15}		
3	Blue	5528.7	1.51×10^{15}		
4	Black	2489.5	6.79×10^{14}		

6.2. HIGH VOLTAGE TEST:

6.2.1. Test connection : Between test core and water
6.2.2. Test Voltage : 2.4 kV ac
6.2.3. Duration of test : 4 Hours
6.2.4. Ambient Temperature : 27°C
6.2.5. Length of Sample : 10.0 meters
6.2.6. Result

Sl. No.	Identification	Observed
1	Red	Withstood
2	Yellow	Withstood
3	Blue	Withstood
4	Black	Withstood

Conclusion: The test results comply with IEC-60502- Part 1: 2004 with amendment 1: 2009 and DEWA Specification.

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NOTE

a) The test results relate only to the item(s) tested.

b) Publication or reproduction of this report in any form other than by complete set of the whole report and in the language written is not permitted without the written consent of CPRI.

c) Any corrections / erasures invalidate this test report / certificate

d) NABL has Accredited this laboratory as per IEC / ISO 17025-2005 standard, vide Certificate No. TC-5452 for the tests carried out

e) Any anomaly / discrepancy in the test report / certificate should be brought to our notice within 45 days from the date of issue

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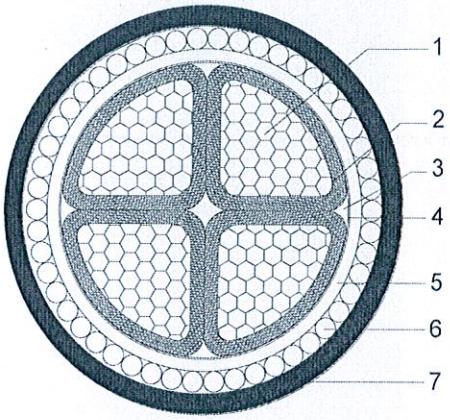
الوطنية لصناعة الكابلات
NATIONAL CABLES INDUSTRY

Cross Sectional Drawing

Size: 4x185 mm², AL/XLPE/SWA/PVC 0.6/1 kV Cable

Reference Standard : DEWA Specs. 1.5.1.3.5.01-Rev.3 and IEC 60502-1

1. Conductor	:	Plain Aluminium, Sectoral Stranded Compacted
2. Insulation	:	Cross-Linked Polyethylene (XLPE)
3. Fillers	:	Polypropylene Strings
4. Binding Tape	:	Polypropylene Tapes
5. Inner Sheath	:	Extruded Polyvinyl Chloride (PVC, Type ST2)
6. Armour	:	Galvanized Steel Wire Armour
7. Outer Sheath	:	Extruded Polyvinyl Chloride (PVC, Type ST2), Color: **Black**



Size	A1	A2	A3	A4	t1	t2	d3	t4
mm²	mm	mm	mm	mm	mm	mm	mm	mm
4x185	43.1	46.4	51.4	57.0	1.6	1.4	2.5	2.8

A1 = Approx. dia over assembled cores
A2 = Approx. diameter over bedding
A3 = Approx. diameter over armour
A4 = Approx. overall diameter

t1 = Nominal thickness of insulation
t2 = Nominal thickness of bedding
d3 = Nominal diameter of armour wire
t4 = Nominal thickness of outer sheath

Color Code: **Red, Yellow, Blue & Black**

Embossing on the Outer Sheath in Max 150 mm spacing along TWO lines :

DEWA ELECTRIC CABLE 600/1000 V, 4x185 SQMM, AL/XLPE/PVC/SWA/PVC, IEC 60502-1
NATIONAL CABLES INDUSTRY, UAE, PO: 3411800488 (2018)

DWG No.: NCI-4x185-1 kV-3411800488

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यह ड्राइंग सीपीआरआई की परीक्षण रिपोर्ट से संबंधित है।
THIS DRAWING PERTAINS TO CPRI TEST REPORT
सं. सीडीडी / No. CPRIBLR CAB19T0028
दिनांक / Dated :.. 12.02.2019

परीक्षण इंजीनियर/Test Engineer