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CEB

SPECIFICATION

ALUMINIUM CONDUCTORS STEEL REINFORCED (ACSR CONDUCTORS)

CEB Approved Specification
24/07/2023
Chairperson Dist. Coordination Committee

CEYLON ELECTRICITY BOARD

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SPECIFICATION FOR ALUMINIUM CONDUCTORS STEEL REINFORCED (ACSR CONDUCTORS)

1.0 SCOPE

This specification covers the manufacturing and testing of Aluminium Conductors Steel Reinforced (ACSR) for overhead power distribution systems.

a) Aluminium Conductors Steel Reinforced (Weasel) – 7/2.59 mm
b) Aluminium Conductors Steel Reinforced (Raccoon) – 7/4.09 mm
c) Aluminium Conductors Steel Reinforced (Lynx) – 37/2.79 mm
d) Aluminium Conductors Steel Reinforced (GOAT) - 37/3.71 mm
e) Aluminium Conductors Steel Reinforced (ZEBRA) - 61/3.18mm

The procurement entity shall prescribe one of the above categories in price schedule indicating the conductor size and any other extra options. The sizes of Aluminium/Steel wires shall be as stipulated in the Annex - A (Conductor Particulars).

2.0 SYSTEM PARAMETERS

(a)	Nominal voltage	11kV	33kV
(b)	System highest voltage	12kV	36kV
(c)	System frequency	50 Hz	50 Hz
(d)	Number of phases	03	03
(e)	Method of earthing	Effectively earthed	Non effectively earthed
(f)	System faults level	12.5kA rms	13.1kA rms
(g)	Nominal voltage	11kV	33kV

3.0 SERVICE CONDITIONS

(a)	Annual average ambient temperature	30 °C
(b)	Maximum ambient temperature	40 °C
(c)	Maximum relative humidity	90%
(d)	Solar Radiation	4.5 kWh/m²/day
(e)	Environmental conditions	Humid tropical climate with heavily polluted atmosphere
(f)	Operational altitude	From M.S.L. to 1900 m above M.S.L.
(g)	Isokeraunic (Thunder days) level	100 days

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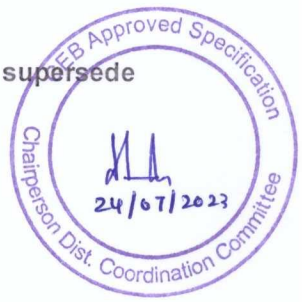
4.0 APPLICABLE STANDARDS

The ACSR shall be manufactured in accordance with the latest editions of the standards specified below and amendments thereof.

(a)	BS 215-2 (1970)	Specification for Aluminium conductors and aluminium conductors, steel-reinforced for overhead power transmission
(b)	BS 2627 (1970)	Specification for wrought Aluminium for electrical purposes, Wire
(c)	ANSI/ASTM B233-97	Standard specification for Aluminium 1350 Drawing Stock for electrical purposes
(d)	BS EN 50189 (2000)	Conductors for over head lines. Zinc coated steel wires
(e)	BS EN 50182: 2001	Conductors for overhead lines — Round wire concentric lay stranded conductors

Material conforming to other International Standards which are equal to or higher but not less stringent than the Standards stipulated above may be offered. When such alternative Standards are used, reference to such Standards shall be quoted and English language copies of such Standards shall be provided with the offer.

However, in the event of discrepancy, details given in this CEB specification supersede above standards.



5.0 BASIC FEATURES

5.1 Design of Wire

(a) The Aluminium wire used in the manufacture of ACSR shall conform to BS 2627. Joints in the base rod or wire before final drawing shall be permitted in accordance with the clause 3.3.1 of BS 215 Part 2. Joints in the Aluminium wire shall not be permitted in the final drawing.

(b) The Coefficient of Linear Expansion is 23 x $10^{-6}/^{0}C$.

(c) The Galvanized Steel wire used in the manufacture of ACSR shall conform to BS EN 50189. Joints in the base steel rod or wire before final drawing shall be permitted in accordance with the clause 3.3.2 of BS 215 Part 2. Joints in the steel wire shall not be permitted in the final drawing.

(d) Aluminium and Steel wires shall be uniform in quality, circular in cross section, clean, smooth and free from harmful defects, splinter irregularities and brittle places.

(e) The sizes of Galvanized Steel wires and Aluminium wires shall be as stipulated in the Annexure - A1 (Schedule of Technical Particulars - ACSR)

5.2 Construction of Aluminium Conductors Steel Reinforced (Stranding)

(a) The ACSR shall be manufactured in accordance with BS 215 Part 2.

(b) The lay ratio of the different layers shall be within the limits given in Table 1 of BS 215 Part 2.

(c) In all constructions, the successive layers shall have opposite directions of lay, the outermost layer being right-handed. The wires in each layer shall be evenly and closely stranded.

(d) In conductors having multiple layers of Aluminium wires, the lay ratio of any Aluminium layer shall not be greater than the lay ratio of the Aluminium layer immediately beneath it.

(e) Steel wires shall be formed during stranding so that they remain inert when the conductor is cut.

(f) Steel core and the inner layers of Aluminium shall be covered with suitable grease during manufacture, but no grease shall be applied to the finished conductor. Sufficient grease shall be applied to the Steel and inner Aluminium strands to fill the inter-strand spaces (viz. Inner Layer Protection).

(g) The completed conductor shall be smooth and free from imperfections, dirt, grit, excessive amounts of drawing oil and other foreign deposits.

5.3 Materials

5.3.1 Aluminium Re - Draw Rods

Aluminium Re - Draw Rods used in the manufacturing of Aluminium wire for the fabrication of ACSR shall conform to ANSI / ASTM B 233-97.

The quality of Aluminium Re - Draw rods used for the manufacture of ACSR conductor shall be as stipulated below.

(a) The purity of the Aluminium Re-Draw rods shall not be less than 99.5%. The percentage composition of other elements shall not be more than the values stipulated in the below.

	Element	Allowed % Max
i.	Silicon	0.10
ii.	Iron	0.40
iii.	Copper	0.05
iv.	Manganese	0.01
v.	Chromium	0.01
vi.	Zinc	0.05
vii.	Boron	0.05
viii.	Gallium	0.03
ix.	Vanadium plus titanium, total	0.02

x.	Other elements, each	0.03
xi.	Other elements, total	0.10
Total % of impurities shall not be more than		**0.5**

(b) Temper of the Aluminium Re - Draw Rods shall be H14 classification.

(c) The tensile strength of rods shall be between 103 MPa to 138 MPa.

(d) The maximum Electrical Resistivity of the Aluminium Re-Draw Rods at 20°C shall be 0.028080 μΩm.

(e) Quality Assurance certification conforming to ISO 9001:2015 shall be followed in the manufacture of the Aluminium Re - Draw Rods. The bidders shall furnish documentary evidence that the Aluminium Re - Draw Rods manufacturers have obtained ISO 9001:2015 certification

Offers of bidders who fail to furnish the proof of ISO 9001:2015 certifications for Aluminium Re - Draw Rods will be rejected.

5.3.2 Reinforcement Steel Wire

(a) The Galvanized Steel wire used for the reinforcement of the ACSR conductor shall conform to BS EN 50189 and the tensile strength grade of the Steel wire shall be conform to the Table 3 –mechanical properties of ST1A wires of BS EN 50189.

(b) The tensile strength and stress at 1% elongation values, calculated on the nominal dimensions of the finished wire, shall confirm to Table 3 of BS EN 50189.

(c) The elongation shall confirm to Table 3 of BS EN 50189, measured after fracture on an original gauge length of 250mm and the coefficient of linear expansion is 11.5 x 10-6/^{0}C.

(d) The steel wire shall not fracture when wrapped around a cylindrical mandrel of diameter given in the appropriate column of Table 3 of BS EN 50189 to form a close helix of eight turns at a rate not exceeding the value stated in Table 3 of BS EN 50189.

(e) The numbers of twists on a length of 100 times the wire diameter that causes fracture shall be confirm to Table 3 of BS EN 50189.

(f) The weight and uniformity of coating and zinc adhesion shall be in accordance with Table 2 of BS EN 50189.

(g) The tolerance on nominal diameter of the Galvanized Steel wire shall confirm to Table 3 of BS EN 50189.

(h) Quality Assurance certification conforming to ISO 9001:2015 shall be followed in the manufacture of the Galvanized Steel wire. The bidders shall furnish documentary evidence that the Galvanized Steel wire manufacturers have obtained ISO 9001:2015 certifications.

Offers of bidders who fail to furnish the proof of ISO 9001:2015 certification for Reinforcement Steel wire will be rejected.

5.3.3 Grease

The grease used for corrosion protection in the manufacture of ACSR shall have the following requirements satisfying BS EN 50182.

(a) All the conductor is greased except the outer layer as indicated in 5.2(f).

(b) The weight of the grease shall confirm the values given in BS EN 50182.

(c) It shall not flow or deteriorate at temperatures up to 75^0C.

(d) It shall not be inimical to Aluminium or Galvanized Steel.

(e) It shall have good adhesive and cohesive properties and shall retain these qualities after weathering.

(f) It shall not extrude a surplus to the outside of the conductor after erection.

(g) It shall not present any risks to health and shall comply with all the usual health and safety standards.

The type of grease used in the manufacture of ACSR and technical specifications shall be furnished with the offer.

5.4 Workmanship

(a) The conductors shall be cleaned and free of imperfections, such as pipes, laps, cracks, kinks, bends, twists, seems excessive grease and other injurious defects.

(b) Higher quality of work shall be maintained in drawing the wire and fabrication of the conductors.

(c) Due precaution shall be taken to prevent the Aluminium Re - Draw Rods or Aluminium wires making contact with copper conductors, copper parts or copper residues during the process of redrawing stranding as well as storage.

(d) All machines and equipment used for this purpose of redrawing shall be properly cleaned, free from any copper residues.

6.0 REQUIREMENTS FOR SELECTION

6.1 Quality Assurance

The manufacturer/s shall possess ISO 9001:2015 or latest Quality Assurance Certification valid throughout the delivery period of this bid, for the manufacture of ACSR conductor. The Bidder shall furnish copies of the ISO certificate certified as true copy of the original by the manufacturer, along with the offer.

6.2 Manufacturing Experience

The manufacturer shall have minimum of five (5) years experience in manufacturing ACSR Conductors. Out of this period offered ACSR type should have been supplied successfully outside the country of the manufacturer for minimum of three (3) years for usage in utilities. The product offered has to be in same voltage range of offered item and shall have been used in service utilities over past 5 years.

If the manufacturer has supplied similar items to CEB for the last three (3) years with proven sales records; without any adverse performance records, such manufacturers will be exempted from above requirements.

6.3 Type Tests

The following Type Test Certificates conforming to relevant standard stipulated in clause 4.0 or any other international standard which is not less stringent, issued by:

Either

(a) an accredited independent testing laboratory acceptable to the CEB or

(b) an accredited or independent testing laboratory acceptable to the CEB where the type tests

have been witnessed by CEB or a reputed independent body acceptable to CEB shall be furnished with the offer. Type Test Certificates shall clearly indicate the relevant standard, items concerned, showing the manufacturers identity, type No. /catalogue No. and basic technical parameters. In case if the submitted type tests are according to any other international standard which is not less stringent than the specified, then the copy of the used standard in English shall be submitted with offer.

Proof of accreditation and accredited scope by a national/ international authority shall be forwarded with the offer. Test certificates shall be complete including all the pages as issued by the testing authority. Type test certificates shall be in English language. Parts of test certificates shall not be acceptable.

Following type test certificates for Aluminium wires, and Galvanized Steel wire used for the fabrication of ACSR and for the manufactured ACSR conductor carried out in accordance with the specified standard, by a recognised independent testing authority acceptable to the purchaser shall be provided with the bid. The test reports shall be complete including all the pages as issued by the testing authority. Parts of the Test Report shall not be acceptable.

A. Type Test Certificates for Aluminium Re-Draw Rods

(i). Tensile test

(ii). Determination of chemical composition and purity

(iii). Temper test

(iv). Electrical resistivity test

B. Type Test Certificates for Aluminium wires

For the Aluminium wires, the following test report carried out according to BS EN 50182 should be submitted with the offer.

(i). Dimension tests

(ii). Tensile strength

(iii). Elongation (If applicable)

(iv). Wrapping test

(v). Resistivity test

(vi). Welding

C. Type Test Certificates for Steel wires

For the Steel wires used, the following test report carried out according to BS EN 50182 should be submitted with the offer.

(i). Dimension tests

(ii). Determination of stress at 1% elongation

(iii). Tensile test

(iv). Elongation test

(v). Wrapping test

(vi). Mass of zinc

(vii). Zinc Dip Test

(viii). Adhesion of Zinc Coating

D. Type Test Certificates for Grease

For the type of grease used, the following test report carried out according to BS EN 50182 should be submitted with the offer.

(i). Mass per unit Length

(ii). Drop point

E. Type Test Certificates for Finished ACSR Conductor

For the ACSR conductor used, the following test report carried out according to BS EN 50182 should be submitted with the offer.

(i). Surface Condition

(ii). Diameter

(iii). Inertness

(iv). Lay ratio and direction of lay
(v). Number and type of wires
(vi). Mass per unit length
(vii). Stress Strain Curves
(viii). Tensile breaking strength
(ix). Stringing test

7.0 INFORMATION TO BE FURNISHED WITH THE OFFER

The following shall be furnished with the offer.

(a) Following technical details in English clearly identifying the offered items, but not limited to:
  (i). Chemical Composition
  (ii). Comprehensive catalogues.
  (iii). Dimensional drawings.
  (iv). Complete mechanical properties including braking load, modulus of elasticity, co-efficient of thermal expansion etc.
  (v). Electrical characteristics including D.C. resistance at 20^0C, co-efficient of variation of resistance.
  (vi). Schematic diagrams.
  (vii). Calculations, graphs and tables.
  (viii). Operational literature.

(b) Technical details about grease used as per clause 5.4.

(c) ISO 9001:2015 or latest Quality Assurance Certificate in accordance with clause 6.1.

(d) Manufacturer shall furnish a list of supplies with supplied item, purchaser (specifying address contact persons and contact details, country), year & quantity to prove his manufacturing experience and outside the country sales in accordance with Clause 6.2.

(e) Type Test Certificates in accordance with the clause 6.3.

(f) Duly filled and signed 'Annex - C: Schedule of Technical Requirements and Guaranteed Technical Particulars'.

Not furnishing above documents and details may result in offer being rejected.

8.0 PERFORMANCE GUARANTEES, WARRANTIES AND OTHER REQUIREMENTS

Manufacturer should provide CEB a warranty ensuring that cables supplied meet the specification and any defected cable shall be replaced without extra cost during the first year after the final delivery to CEB stores.

9.0 SAMPLES

Two specimen samples of length 2 meter from offered category shall be supplied with the offer. If the size of the conductor specified in the bid is not available with the manufacturer at the time of submitting the samples the manufacturer may submit a sample closest to the size of the conductor specified.

The grade of the Aluminium of the sample shall be same as specified. The manufacturer shall indicate clearly on the sample, the code name and the physical characteristics of the conductor sample.

10.0 SPARES

Not applicable

11.0 PACKING AND LABELING/MARKING

11.1 Packing

(a) The ACSR shall be supplied in wooden drums. The ACSR shall be supplied in continuous length per drum as given in the Annexure A1.

(b) Drums shall be stoutly constructed of good quality timber or steel and clearly marked with the length and type of conductor in a manner not easily removable. Drums shall be securely battened around the perimeter and shall be lined with approved impervious material to prevent contact between the contents and both the drum itself and any chemicals with which the drum has been treated. Drums shall be suitable for rolling on the flanges without causing damage to the conductor and the direction of rolling shall be clearly shown.

(c) All timber drums and battens shall be protected from deterioration by termite or fungus attack by an approved impregnation treatment at the works before dispatch. Such substance shall not be harmful to the conductor.

(d) All drums shall have spindle holes of diameter between 100mm to 120mm and the holes shall be stoutly reinforced with steel plates.

(e) The exposed end of the Conductor in each drum shall be crimp-sealed and clamped to the drum.

11.2 Labelling/ Marking

Each drum shall be labelled with clear stencil on both sides of the drum with the following.

(a) CEYLON ELECTRICITY BOARD, TENDER NO :
(b) Manufacturer's name
(c) Direction of rolling
(d) Lifting instructions and limitations

The letters shall not be less than 75 mm of height and the ink used shall be water-proof. An Aluminium name plate shall be fixed to each drum clearly showing the following.

(a) Serial No. The serial numbers shall be from 001 onwards
(b) Conductor type, material and stranding
(c) Length of the conductor
(d) Net Weight
(e) Gross Weight
(f) Manufacturer's batch number.
(g) Winding date
(h) Approximate measurements of the drum

12.0 INSPECTION AND TESTING

12.1 Sample Tests

12.2 Inspection

The Successful bidder shall make necessary arrangements for inspection by an Engineer appointed by the CEB and also to carry out in his presence necessary Acceptance tests on procured item and material without any additional cost. Acceptance test reports shall be a part of the shipping document. CEB may waive off the inspection either with the condition of witnessing the acceptance tests by an independent body acceptable to CEB or completely. In such a situation a notice of waive off will be issued in-advance to the supplier

12.3 Acceptance Tests

The following Acceptance / Sample Tests conforming to BS 2627, BS EN 50189 and BS 215, IEC 61089, IEC 61394 and BS EN 50182 shall be witnessed by the representative of the CEB.

A. Aluminium wires

(i). Dimension tests
(ii). Tensile test
(iii). Elongation (If applicable)
(iv). Wrapping test
(v). Resistivity test

B. Steel wires

(i). Dimension tests
(ii). Determination of stress at 1% elongation
(iii). Tensile test
(iv). Elongation test
(v). Wrapping test

(vi). Galvanizing test
(vii). Mass of zinc
(viii). Zinc Dip Test
(ix). Adhesion of Zinc Coating

C. Grease

(i). Mass per unit Length
(ii). Drop point

D. ACSR Conductor

(i). Surface Condition
(ii). Diameter
(iii). Inertness
(iv). Lay ratio and direction of lay
(v). Number and type of wires
(vi). Mass per unit length
(vii). Stress Strain Curves
(viii). Tensile breaking strength

13.0 ANNEXES

Annex – A : Conductor Particulars
Annex – B : Price Variation
Annex – C : Schedule of Technical Requirements and Guaranteed Technical Particulars for ACSR
Annex – D : Non-compliance schedule

Annex A - CONDUCTOR PARTICULARS

Description	Conductor Code					
	Weasel	Raccoon	Dog	Lynx	Goat	Zebra
Nominal area of Complete Conductor (mm^2)	36.90	91.95	118.50	226.20	400.00	484.50
No. & Diameter of Wires						
a. Aluminium (mm)	6/2.59	6/4.09	6/4.72	30/2.79	30/3.71	54/3.18
b. Steel (mm)	1/2.59	1/4.09	7/1.57	7/2.79	7/3.71	7/3.18
Overall Diameter of Conductor (mm)	7.77	12.27	14.15	19.53	25.97	28.62
Approx. mass of Conductor (kg/km) – without grease	128	319	394	842	1489	1621
Calculated D.C. Resistance at 20^0C (Ω/km)	0.9077	0.3632	0.2733	0.1576	0.0894	0.0674
Calculated Breaking Load (kN)	11.38	27.06	32.65	79.97	135.13	131.92
Modulus of Elasticity of Complete Conductor (N/mm^2)	79000	79000	75000	80000	80000	69000
Coefficient of Linear Expansion (^0C)	$19.1x10^{-6}$	$19.1x10^{-6}$	$19.8x10^{-6}$	$17.8x10^{-6}$	$17.8x10^{-6}$	19.3x10-6
Length of Conductor per Drum (km)	3.0	1.2	1.2	1.6	1.6	2.0

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Annex B - PRICE VARIATION

1. BASIS OF THE OFFER

a. Suppliers of Aluminium Conductors Steel Reinforced are required to make their offers on the basis of a Base Price plus a Fixed Price Margin.

b. The Base Price shall be the LME Official Settlement Price (Cash Official Offer Price) of Aluminium High Grade 99.7% at London Metal Exchange (LME) in US Dollars on the 14 day before the closing of Bids (exclusive of the bid closing date) or the previous working day if that day is a non-working day at the LME

c. The Fixed Price Margin (FP) shall be quoted in the currency of choice of the bidder.

d. Accordingly FOB price of ACSR conductor of foreign bidders and ex-factory price of ACSR conductor of local bidders for the purpose of evaluation shall be computed as;

$$(B_0 \times MT \times E')US_0 + (FP \times MT)CC_0$$

Where:

B_0 : Base Price which is the LME Official Settlement Price (Cash Official Offer Price) of Aluminium High Grade 99.7% in USD per Metric Ton at the LME on the fixed date (Clause 1(b) above).

MT : Quantity of ACSR required in Metric ton.

US_0 : Currency Conversion rate from the US Dollars to Sri Lanka Rs. prevailing on the date of bid opening.

FP : Fixed Price Margin per Metric ton of ACSR in the currency choice

CC_0 : Currency Conversion rate from the currency of choice of the Bidder to Sri Lanka Rupees prevailing on the 14th day before Bid opening.

E' : The percentage of Aluminium in the Aluminium Conductors Steel Reinforced as indicated in the table below:

i.	Weight of Aluminium in 7/2.59 (Weasel) Conductor	68 %
ii.	Weight of Aluminium in 7/4.09 (Racoon) Conductor	68 %
iii.	Weight of Aluminium in 37/2.79 (Lynx) Conductor	60 %
iv.	Weight of Aluminium in 37/3.71 (Goat) Conductor	60 %
v.	Weight of Aluminium in 61/3.18 (Zebra) Conductor	73 %

2. AWARD PRICE

a. The FOB award price for foreign bidders and ex-factory award price for local shall be computed as;

$$(B_1 \times MT \times E') \text{ in US Dollars } + (FP \times MT) \text{ in the currency of choice quoted}$$

b. The Ex-factory Award Price of Local Bidders offering Aluminium Conductors shall be computed as;

$$(B_1 \times MT \times E')US_1 + (FP \times MT)CC_1$$

Where:

B_1	:	Base Price which is the LME Official Settlement Price (Cash Official Offer Price) of Aluminium High Grade 99.7% in USD per Metric Ton at the 3rd working day immediately after the day of award
MT	:	Quantity of ACSR required in Metric ton.
US_1	:	Currency Conversion rate from the US Dollars to Sri Lanka Rupees prevailing at the 3rd working day immediately after the day of award
FP	:	Fixed Price Margin per Metric ton of ACSR in the currency choice
CC_0	:	Currency Conversion rate from the currency of choice of the Bidder to Sri Lanka Rupees prevailing at the 3rd working day immediately after the day of award
E'	:	The percentage of Aluminium in the Aluminium Conductors Steel Reinforced as indicated in the table clause 1. d.

c. Intimation of the award will be faxed/telexed to the successful bidder and or his agent in Sri Lanka.

3. CONVERSION OF CURRENCY

a. For the purpose of the evaluation the Price Bo in US Dollars and the Fixed Price Margin (FP) in the currency of choice of the Bidder will be converted to Sri Lanka Rupees at the official Selling Exchange Rate of the Central Bank of Sri Lanka prevailing on the 14th day before Bid opening.

b. The payment for the supply will be made to the supplier at the contract price in the currency quoted for the Fixed Price Margin (FP). The base price B_1 in US Dollars will be converted to the currency of the FP at the official Selling Exchange rate at the Central Bank of Sri Lanka prevailing at the 3rd working day immediately after the day of award.

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c. The payment for local bidders for the supply of Aluminium Conductors Steel Reinforced will be made in LKR. The Base Price B_1 in US Dollars will be converted to LKR at the official Selling Exchange rate at the Central Bank of Sri Lanka prevailing at the 3rd working day immediately after the day of award.

Annex C - SCHEDULE OF TECHNICAL REQUIREMENTS AND GUARANTEED TECHNICAL PARTICULARS FOR ACSR

(CEB Requirements shall be filled by the procurement entity and information of the offer shall be filled by the manufacturer. Following Information shall be furnished with the offer for each item offered.)

				Offered
1.	**ALUMINIUM RE-DRAWS RODS (used for the manufacture Al wire for ACSR)**		N/mm²	
	(i).	Tensile stress	H14	
	(ii).	Temper classification	μΩm	
	(iii).	Electrical Resistivity	Yes/No	
	(iv).	Whether ISO 9001:2015 quality assurance certification is Furnished		
	(v).	Whether the following Type Test Certificates provided		
		a. Tensile test		
		b. Determination of chemical composition and purity		
		c. Temper test		
		d. Electrical resistivity test		
	(i).	Whether the Type Test certificates provided satisfy the conditions stipulated in clause 6.3	Yes/No	
	(ii).	Chemical composition as indicated in the below		
	(iii).	Element		
		a. Silicon	% Max	
		b. Iron	% Max	
		c. Copper	% Max	
		d. Manganese	% Max	
		e. Chromium	% Max	
		f. Zinc	% Max	
		g. Boron	% Max	
		h. Gallium	% Max	
		i. Vanadium plus titanium, total	% Max	
		j. Other elements, each	% Max	
		k. Other elements, total	% Max	
		l. Total % of impurities shall not be more than	% Max	
2.	**ALUMINIUM WIRE**			
	(i).	Diameter	mm	
	(ii).	Resistivity at 20°C	μΩm	
	(iii).	Coefficient of Linear Expansion	/°C	
	(iv).	Tensile Stress (max.)	N/mm²	

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	(v).	Whether ISO 9001:2015 Quality Assurance certification is furnished	Yes/No	
	(vi).	Whether the following Type Test certificates provided		
		a. Dimension tests	Yes/No	
		b. Tensile test	Yes/No	
		c. Elongation (If applicable)	Yes/No	
		d. Wrapping test	Yes/No	
		e. Resistivity test	Yes/No	
		f. Welding	Yes/No	
	(vii).	Whether the Type Test certificates provided satisfy the conditions stipulated in clause 6.3	Yes/No	
3.	**GALVANIZED STEEL WIRE**			
	(i).	Diameter	mm	
	(ii).	Tensile Stress	N/mm²	
	(iii).	Stress at 1% elongation	N/mm²	
	(iv).	Coefficient of linear expansion	/°C	
	(v).	Resistivity at 20°C	μΩm	
	(vi).	Whether ISO 9001:2015 Quality Assurance certification is furnished	Yes/No	
	(vii).	Whether the following Type Test certificates provided		
		a. Dimension tests	Yes/No	
		b. Determination of stress at 1% elongation	Yes/No	
		c. Tensile test	Yes/No	
		d. Elongation test	Yes/No	
		e. Wrapping test	Yes/No	
		f. Mass of zinc	Yes/No	
		g. Zinc Dip Test	Yes/No	
		h. Adhesion of Zinc Coating	Yes/No	
	(i).	Whether the Type Test certificates provided satisfy the conditions stipulated in clause 6.3	Yes/No	
4.	**GREASE**			
	(i).	Name/Type of Grease		
	(ii).	Melting Temperature	°C	
	(iii).	Whether the grease is stable at 75°C	Yes/No.	
	(iv).	Mass of Grease	Kg/km	
	(v).	Whether the following Type Test certificates provided		
		a. Mass per unit Length	Yes/No	
		b. Drop point	Yes/No	
	(vi).	Whether the Type Test certificates provided satisfy the conditions stipulated in clause 6.3	Yes/No	

5.	**ACSR CONDUCTOR**			
	(i).	Aluminium Wires	Nos.	
	(ii).	Galvanized Steel Wires	Nos.	
	(iii).	Overall Diameter	mm	
	(iv).	Nominal area of complete conductor	mm^2	
	(v).	Lay ratio for Steel Core	Max Min	
	(vi).	Lay ratio for Aluminium layers	Max Min	
	(vii).	Ultimate Tensile Strength	kN	
	(viii).	D.C. Resistance at 20°C	Ω/km	
	(ix).	AC resistance and inductive reactance at 20°C, 50Hz (R+jX)	Ω/km	
	(x).	Coefficient of Linear Expansion	/°C	
	(xi).	Coefficient of Variation of Resistance	/°C	
	(xii).	Linear Density	Kg/km	
	(xiii).	Modulus of Elasticity	N/mm^2	
	(xiv).	Whether the following Type Test Certificates provided		
		a. Surface Condition	Yes/No	
		b. Diameter	Yes/No	
		c. Inertness	Yes/No	
		d. Lay ratio and direction of lay	Yes/No	
		e. Number and type of wires	Yes/No	
		f. Mass per unit length	Yes/No	
		g. Stress Strain Curves	Yes/No	
		h. Tensile breaking strength	Yes/No	
		i. Stringing test	Yes/No	
	(xv).	Whether the Type Test certificates provided satisfy the conditions stipulated in clause 6.3	Yes/No	
	(xvi).	Whether the drum details including drawing & dimension are provided	Yes/No	

.....
Signature of the Manufacturer and seal

.....
Date

I/We certify that the above data are true and correct

.....
Signature of the Bidder and seal

CEB Approved Specification
24/07/2023
Chairperson Dist. Coordination Committee

.....
Date

Annex D - NON-COMPLIANCE SCHEDULE

On this schedule the bidder shall provide a list of non-compliances with this specification, documenting the effects that such non-compliance is likely to have on the equipment life and operating characteristics. Each non-compliance shall be referred to the relevant specification clause.

Clause No.	Non-Compliance

.....
Signature of the Manufacturer

.....
Date

I/We certify that the above data are true and correct

.....
Signature of the Bidder and seal

.....
Date

CEB Approved Specification
24/07/2023
Chairperson Dist. Coordination Committee