

ABC

BARE CONDUCTORS &
AERIAL BUNDLED CABLES

BARE



Central Cables Berhad
(7169-A)



CONTENT

Aerial Bundled Cable (ABC) - Low Voltage (LV)	1
Aerial Bundled Cable (ABC) - Medium Voltage (MV)	2-4
Bare Aluminium Conductor	5
All Aluminium Conductor (AAC)	6
Stranded Hard - Drawn All Aluminium Conductor (AAC)	7
All Aluminium Alloy Conductor (AAAC)	8
Bare All Aluminium Alloy Conductor (AAAC)	9
Aluminium Conductor Steel Reinforced (ACSR)	10
Bare Aluminium Conductor Reinforced (ACSR)	11
Low Loss Conductor	12



AERIAL BUNDLED CABLE (ABC) - LOW VOLTAGE (LV)

**0.6/1(1.2) KV AL - Aerial Bundled Cable for Overhead Distribution Lines.
IEC 60228, IEC 60811, BS 2627, IEC 60502-1 : 2004**

S/N	Cable Size	Standard Packing		Phase Conductor				Messenger/Suspension Unit				Street Lighting				Continuous current rating at 30°C ambient temp (A)
		Length (m)	Weight (kg)	No. of strands	Diameter (mm)	Cross-section area (mm ²)	Max. conductor resistance at 20°C deg (ohm/km)	No. of strands	Diameter (mm)	Cross-section area (mm ²)	Max. conductor resistance at 20°C deg (ohm/km)	No. of strands	Diameter (mm)	Cross-section area (mm ²)	Max. conductor resistance at 20°C deg (ohm/km)	
1	1 x 16mm ² + 1 x 25mm ²	1000	170	7	4.9	16	1.91	7	6.0	25	1.312	-	-	-	-	55
2	3 x 16mm ² + 1 x 25mm ²	1000	285	7	4.9	16	1.91	7	6.0	25	1.312	-	-	-	-	50
3	3 x 35mm ² + 1 x 25mm ²	1000	500	7	7.0	35	0.868	7	5.9	25	1.312	-	-	-	-	123
4	3 x 50mm ² + 1 x 35mm ²	1000	680	7	8.4	50	0.641	7	7.0	35	0.99	-	-	-	-	147
5	3 x 70mm ² + 1 x 50mm ²	1000	940	19	9.9	70	0.443	7	8.4	50	0.69	-	-	-	-	164
6	3 x 95mm ² + 1 x 70mm ² + 1 x 16mm ²	500	848	19	11.7	95	0.320	19	9.9	70	0.469	7	4.9	16	1.91	189
7	3 x 185mm ² + 1 x 120mm ² + 1 x 16mm ²	500	1540	37	16.2	185	0.164	19	13.0	120	0.273	7	4.9	16	1.91	279

AERIAL BUNDLED CABLE (ABC) - MEDIUM VOLTAGE (MV)

6.35/11kV AL - Aerial Bundled Cable for Overhead Distribution Lines. IEC 60502-2: 2005

S/N	Cable Size	Phase Conductor				Messenger/Suspension Unit				Continuous current rating at 30°C ambient temp (A)
		No. of strands	Wire Diameter (mm)	Nominal cross-section area (mm ²)	Max conductor resistance at 20°C (Ω/km)	No. of strands	Wire Diameter (mm)	Nominal cross-section area (mm ²)	Breaking Load(kN)	
1	3C x 50mm ² + 1C x 25mm ²	19	1.78	50	0.641	7	3.00	50	60	116
2	3C x 70mm ² + 1C x 50mm ²	19	2.14	70	0.443	7	3.15	50	62	210
3	3C x 95mm ² + 1C x 50mm ²	19	2.52	95	0.320	7	3.00	50	60	173
4	3C x 185mm ² + 1C x 120mm ²	37	2.52	185	0.164	7	4.67	120	150	259
5	3C x 150mm ² + 1C x 50mm ²	37	2.25	150	0.206	7	3.15	50	62	365
6	3C x 240mm ² + 1C x 50mm ²	61	2.25	240	0.125	7	3.15	50	62	500

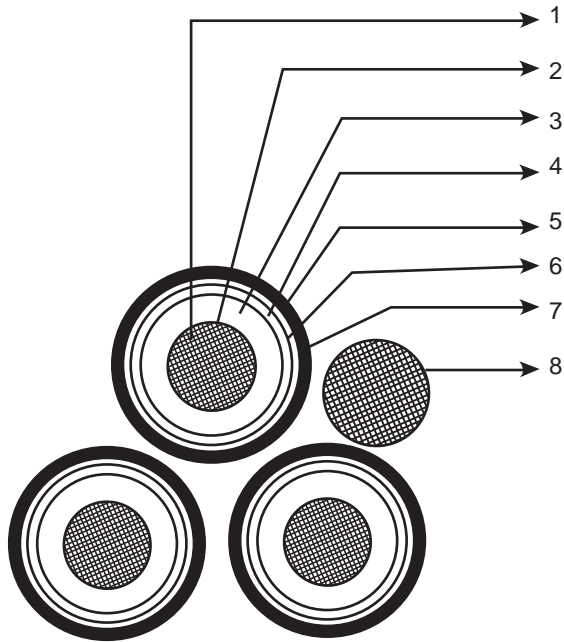
AERIAL BUNDLED CABLE (ABC) MEDIUM VOLTAGE (MV)

19/33kV AL - Aerial Bundled Cable for Overhead Distribution Lines. IEC 60502-2: 2005

S/N	Cable Size	Phase Conductor				Messenger/Suspension Unit				Continuous current rating at 30°C ambient temp (A)
		No. of strands	Wire Diameter (mm)	Nominal cross-section area (mm ²)	Max conductor resistance at 20°C (Ω/km)	No. of strands	Wire Diameter (mm)	Nominal cross-section area (mm ²)	Breaking Load(kN)	
1	3C x 50mm ² + 1C x 50mm ²	19	1.78	50	0.641	7	3.00	50	60	165
2	3C x 150mm ² + 1C x 50mm ²	37	2.25	150	0.206	7	3.00	50	60	315
3	3C x 185mm ² + 1C x 70mm ²	37	2.52	185	0.164	7	3.57	70	91	355
4	3C x 70mm ² + 1C x 50mm ²	19	2.14	70	0.443	7	3.15	50	62	250
5	3C x 150mm ² + 1C x 50mm ²	37	2.25	150	0.206	7	3.15	50	62	370

AERIAL BUNDLED CABLE (ABC) - MEDIUM VOLTAGE (MV)

Cross Section of Medium Voltage Aerial Bundled Cable



No.	Description
1	Conductor
2	Conductor Screen
3	Insulation
4	Insulation Screen
5	Metallic Screen
6	Binder
7	Outer Sheath
8	Messenger

BARE ALUMINIUM CONDUCTOR

Stranded Aluminium Conductor Stranded Multi Wires To BS 6360:1991

Size of Conductor		Nominal diameter of conductor	Maximum resistance at 20°C	Approx.mass
Nominal cross sectional area of conductor	No. & size of wire			
mm ²	No./mm	mm	Ω/km	kg/km
4	7/0.85	2.55	7.41	10.10
6	7/1.04	3.12	4.61	16.00
10	7/1.35	4.05	3.08	27.00
16	7/1.70	5.10	1.91	42.20
25	19/1.35	6.42	1.20	69.50
35	19/1.53	7.65	0.868	94.10
50	19/1.78	8.90	0.641	12.58
70	19/2.14	10.70	0.443	183.00
95	19/2.52	12.60	0.320	255.18
120	37/2.03	14.21	0.253	323.36
150	37/2.25	15.75	0.206	405.30
185	37/2.52	17.64	0.164	500.00
240	61/2.25	20.25	0.125	648.10
300	61/2.52	22.68	0.100	810.10
400	61/2.85	25.65	0.0778	1073.00
500	61/3.20	28.80	0.0605	1350.00
630	61/3.63	32.76	0.0469	1701.89
800	127/2.85	37.05	0.0367	2162.00
1000	127/3.20	41.60	0.0291	2703.00

ALL ALUMINIUM CONDUCTOR (AAC)

Standard Sizes of All Aluminium Conductors for Overhead Power Transmission

Conductor			Approx. overall diameter	Calculated breaking load	Calculated D.C resistance at 20°C	Approx. Net Weight	Code Name
Nominal cross sectional area of conductor	Equivalent copper area	Construction No. / wire diameter					
mm ²	mm ²	mm ²	mm	kN	Ω/km	kg/km	
22	14.2	7/2.06	6.18	3.99	1.227	64	Midge
50	32.2	7/3.10	9.30	8.28	0.5419	144	Ant
60	38.78	7/3.40	10.20	9.90	0.4505	175	Fly
100	64.7	7/4.39	13.17	16.00	0.2702	291	Wasp
150	96	19/3.25	16.25	24.70	0.1825	435	Hornet
200	130	19/3.78	18.90	32.40	0.1349	586	Chafer
250	162	19/4.22	21.10	40.40	0.10830	730	Cockroach
300	197	19/4.65	23.25	48.75	0.08916	886	Butterfly
400	253	37/3.78	26.46	63.10	0.06944	1143	Centipede

Note: Conductor details of other specifications can be provided upon request.

Stranded Hard - Drawn All Aluminium Conductor (AAC)

Nominal cross sectional area of conductor	Construction No. / wire diameter	Calculated area	Approx. overall diameter	Approx. net weight	Minimum breaking load	Calculated DC resistance at 20°C	Hard-drawn copper equivalent area
mm ²	No./mm	mm ²	mm	kg/km	kgf	Ω/km	mm ²
30	7/2.3	29.09	6.9	80	469	0.983	12.62
38	7/2.6	37.16	7.8	102	575	0.769	23.34
55	7/3.2	56.29	9.6	154	838	0.507	35.35
95	7/4.2	96.95	12.6	265	1410	0.295	60.88
150	19/3.2	152.8	16.0	419	2270	0.188	95.96
200	19/3.7	204.3	18.5	560	3030	0.140	128.3
240	19/4.0	238.8	20.0	645	3490	0.120	150.0
300	37/3.2	297.6	22.4	820	4430	0.0969	186.9
400	37/3.7	397.8	25.9	1090	5890	0.0726	249.8
510	37/4.2	512.5	29.4	1410	7460	0.0563	321.9
660	61/3.7	655.8	33.3	1820	9720	0.0441	411.8
850	61/4.2	844.9	37.8	2330	12300	0.0342	530.6
980	91/3.7	978.3	40.7	2710	14500	0.0297	614.4
1260	91/4.2	1260	46.2	3500	18350	0.0230	791.3

All Aluminium Alloy Conductor (AAAC)

Standard Sizes of All Aluminium Conductors for Overhead Power Transmission

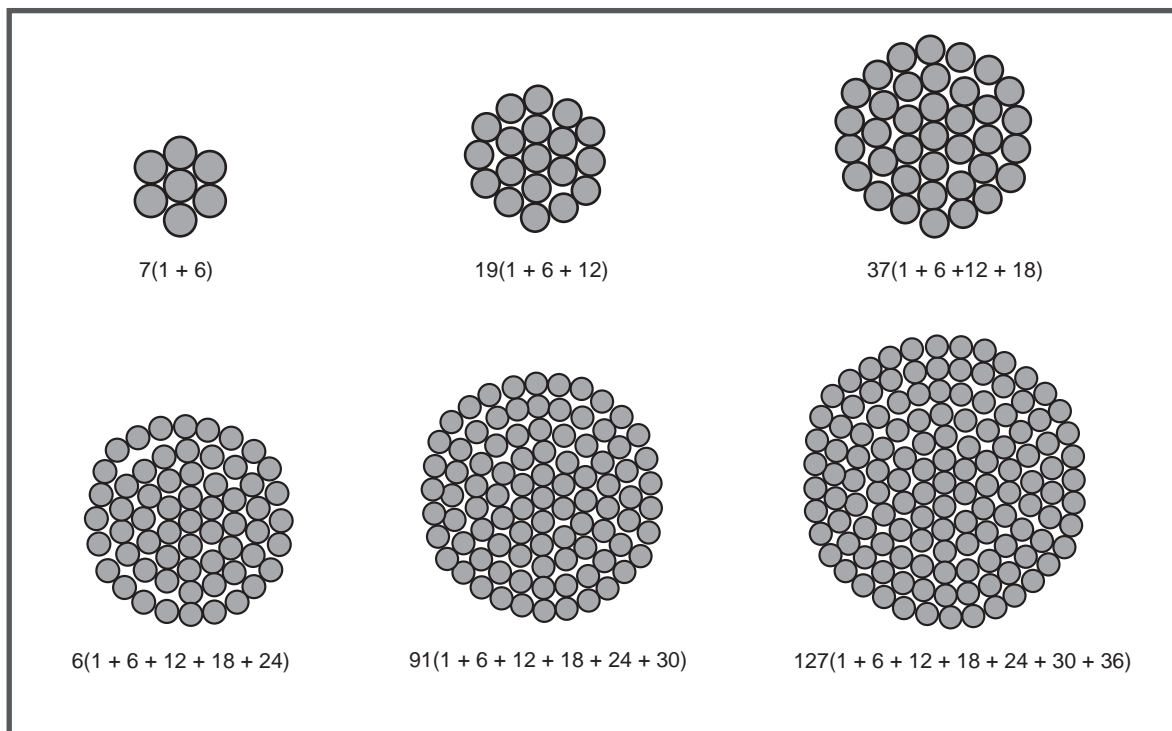
Conductor			Approx. overall diameter	Calculated breaking load	Calculated D.C resistance at 20°C	Approx. Net Weight	Code Name
Nominal cross sectional area of conductor	Equivalent copper area	Construction No. / wire diameter					
mm ²	mm ²	No./mm	mm	kN	Ω/km	kg/km	
25	16.2	7/2.34	7.02	8.44	1.094	81	Almond
30	19.1	7/2.54	7.62	9.94	0.9281	98	Caedar
40	25.8	7/2.95	8.85	13.4	0.6880	130	Fir
50	32.3	7/3.30	9.90	16.80	0.5498	165	Hazel
100	64.5	7/4.65	13.95	33.30	0.2769	137	Oak
150	97	19/3.48	17.40	50.65	0.1830	495	Ash
175	113	19/3.76	18.80	59.10	0.1568	578	Elm
300	194	37/3.53	24.71	101.50	0.09155	995	Upas

Note: Conductor details of other specifications can be provided upon request.

Bare All Aluminium Alloy Conductor (AAAC)

Aluminium alloy (AAAC) contains a small percentage (about 0.6%) of silicon and magnesium elements. It provides several benefits for overhead lines.

- (i) Strength : About twice that of aluminium 1350 (EC).
- (ii) Weight : 20% (approx.) lighter than ACSR conductor of equal diameter.
- (iii) Corrosion resistance : It has a high resistance to atmospheric corrosion which is suitable for coastal and industrial areas.
- (iv) Surface hardness : AAAC's surface is significantly harder than aluminium 1350. It is less liable to damage during installation which is an important advantage of EHV transmission lines where corona and radio interference is a major consideration.
- (v) Termination : Much simpler jointing accessories required compared to ACSR.
- (vi) AC Resistance : AAAC is a non-magnetic material. It does not exhibit the magnetic core losses found in ACSR conductor



Aluminium Conductor Steel Reinforced (ACSR)

Standard Sizes of All Aluminium Conductors Steel Reinforced for Overhead Power Transmission.

Nominal Al. area	Equivalent copper area	Conductor				Approx. overall diameter	Calculated breaking load	Calculated D.C resistance at 20°C	Approx. Weight		Code Name
		Actual Sectional		Construction					Al	Steel	
		Al.	Steel	Al.	Steel						
mm ²	mm ²	mm ²	mm ²	No./mm	No./mm	mm	kN	ohm/km	kg/km	kg/km	
25	16.0	26.25	4.37	6/2.36	1/2.36	7.08	9.61	1.093	72	34	Gopher
30	19.3	31.61	5.27	6/2.59	1/2.59	7.77	11.45	0.9077	87	41	Weasel
40	25.8	42.41	7.07	6/3.00	1/3.00	9.00	15.20	0.6766	117	55	Ferret
50	32.3	52.88	8.81	6/3.35	1/3.35	10.05	18.35	0.5426	145	69	Rabbit
*60	38.6	63.22	36.88	12/2.59	7/2.59	12.95	52.94	0.4566	175	289	Skunk
70	44.8	73.37	42.8	12/2.79	7/2.79	13.95	61.20	0.3936	203	335	Horse
100	64.0	105.0	13.5	6/4.72	7/1.57	14.15	32.70	0.2733	288	106	Dog
150	96.4	158.1	36.8	30/2.59	7/2.59	18.13	69.20	0.1828	437	289	Wolf
150	96.8	158.7	8.8	18/3.35	1/3.35	16.75	35.70	0.1815	437	69	Dingo
175	111.9	183.4	42.8	30/2.79	7/2.79	19.53	79.80	0.1576	507	335	Lynx
175	112.4	184.3	10.2	18/3.61	1/3.61	18.05	41.10	0.1563	507	81	Caracal
200	129.0	212.1	49.5	30/3.00	7/3.00	21.00	92.25	0.1363	586	388	Panther
200	128.0	210.6	11.7	18/3.86	1/3.86	19.30	46.55	0.13670	580	91	Jaguar
*300	197.0	323.0	15.5	18/4.78	7/1.68	24.16	69.67	0.08914	887	123	Batang
400	262.0	428.9	55.6	54/3.18	7/3.18	28.62	131.90	0.06740	1186	435	Zebra

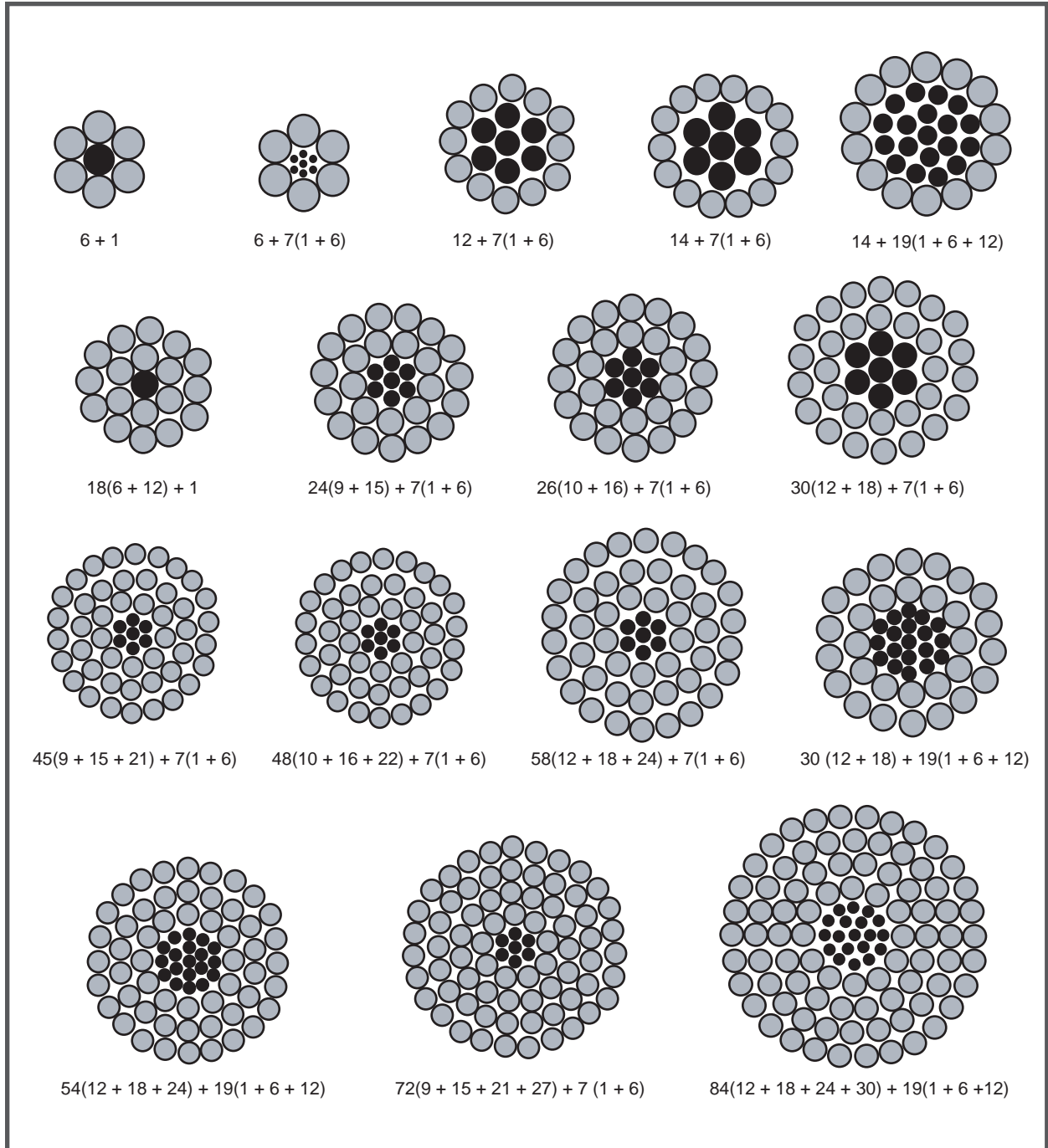
Note: 1) *Not a standard Size in BS 215 : Part 2.

2) Conductor details of other specifications can be provided upon request.

ACSR is a composite, concentrically stranded conductor in which the light weight and good conductivity of aluminium are combined with the high tensile strength of steel. It is composed of one or more layers of EC grad hard-drawn aluminium wires helically stranded around an inner core of high strength zinc-coated steel wires. The inner steel core may be a single zinc coated steel wire, or concentrically stranded of one or more layer of zinc-coated steel wires.

ACSR has long been widely used as overhead high tension transmission lines and has an established reputation for economy and dependability. The illustration below shows typical standard sizes and stranding patterns.

Bare Aluminium Conductor Steel Reinforced (ACSR)



LOW LOSS CONDUCTOR

THERMAL ALUMINIUM ALLOY CONDUCTOR STEEL REINFORCED (STEEL ALUMINIUM CLAD) / TRAPEZOIDAL SHAPED WIRE (TACSR(SA)/TW)

PRODUCT SPECIFICATION

IEC 62219

TNB SPECIFICATION

DESIGN & CONSTRUCTION

	VOLTAGE U/U _m (kV)	Conductor Diameter (mm)	QTY/ BUNDLE	Ampere (A)
ZEBRA	275/300	28.82	2	1434
			3	2151
CURLEW	500/550	31.82	3	2425
			4	3233

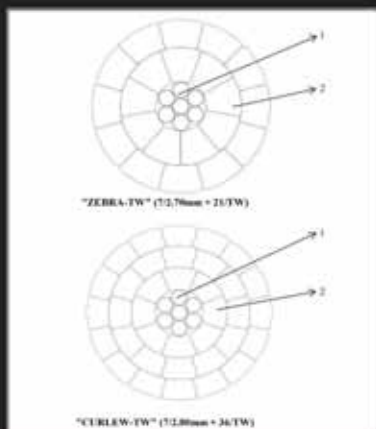
* Operating frequency : 50Hz

MANUFACTURING PROCESS



TYPES OF PRODUCT

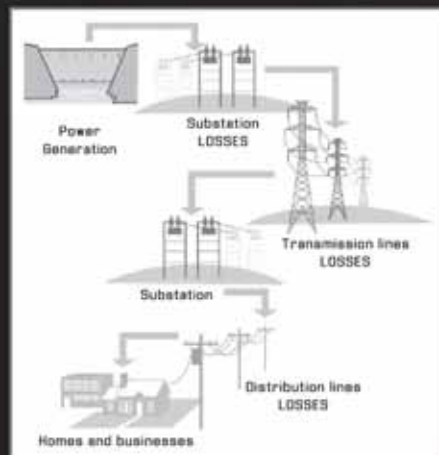
ZEBRA-TW
CURLEW-TW



No	Description	Material
1	Conductor	Aluminium EC 1350-O Clad Steel Wire
2		Thermal-Resistant Aluminium Alloy Wire type AT1



Power Losses Illustration : ACSR VS (TACSR(SA)/TW)



Power Losses for 500km Transmission Line

AMPERE	ACSR	TACSR	Losses Different
100A,40°C	630	500	130
200A,45°C	2570	2033	537
300A,50°C	5885	4661	1224
400A,55°C	10656	8439	2217
500A,60°C	16952	13402	3550
600A,65°C	24817	19641	5176
700A,70°C	34373	27201	7172

ADVANTAGES

- Lower power losses during transmission
- Utilize Thermal Alloy material for higher operating temperature
- Utilize Aluminium Clad steel wire to improve thermal stability

COMPARISON

ACSR VS (TACSR(SA)/TW)

	ZEBRA ACSR	ZEBRA TACSR/SA
Ampere	Up to 717A	Up to 1504A
Noise	39dB	30dB
Resistance at 75°C	0.0857Ω/km	0.0642Ω/km



Central Cables Berhad
Bare Conductors & Aerial Bundled Cables

Central Cables Berhad
(7169-A)

**Address: 7862, Batu Berendam,
75350 Melaka, Malaysia.**

P.O.Box 313, 75760 Melaka.

Tel : +6 (06) 2325821

Fax : +6 (06) 2325823

E-mail : ccb@central-cables.com

Website : www.central-cables.com



CERTIFIED TO ISO 9001:2008
CERT. NO. : AR1438