

LIST OF MATERIALS

Transmission (EHV Transmission Lines)

**Acceptable for Use on Systems of
SARAWAK ENERGY BERHAD**

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The items shown in this Transmission Approved Products List (TAPL) covers material and major equipment used for EHV transmission lines. The list stipulated in this document supersedes all preceding issues including revisions. The updated documents shall be made available on SEB website.

Manufacturer who desire to have their items listed in the Transmission Approved Products List (TAPL) for EHV transmission lines or wish to address any omission in the list, such as an obsolete item, etc., should address to: -

**Chief Executive Officer
Syarikat SESCO Berhad
A Subsidiary of Sarawak Energy Berhad
Menara Sarawak Energy
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Attention: Transmission APL [Vice-President, Transmission for Chief Executive Officer]**

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1.0 EHV TRANSMISSION LINES COMPONENTS

1.1 Conductor

Manufacturer	Country of Manufacturer	Model / Type	Voltage Rated (kV)
Universal Cable (M) Berhad	Malaysia	AAAC Sycamore	132
		ACSR Drake	275 / 500
Universal Cable (Sarawak) Sdn Bhd	Malaysia	AAAC Sycamore	132
		ACSR Drake	275 / 500
Tenaga Cable Industries Sdn Bhd	Malaysia	ACSR Drake	275 / 500
Chongqing Taishan Cable Co., Ltd. *	China	ACSR Drake	275 / 500
Southern Cable Sdn Bhd	Malaysia	ACSR Drake	275 / 500
Olympic Cable Company Sdn Bhd	Malaysia	ACSR Drake	275 / 500
Jiangsu Zhongtian Technology Co., Ltd*	China	ACSR Drake	275 / 500
*Importation of the said product shall be governed by prevailing legislation and regulations of the relevant authorities of Malaysia, including but not limited to Ministry of International Trade & Industry (MITI)			

1.2 Optical Fiber Ground Wire (OPGW)

Manufacturer	Country of Manufacturer	Model / Type	Voltage Rated (kV)
Leader Cable Industry Berhad	Malaysia	AACSR, 24 single mode ITU-T G.652D optical fibre	132 / 275
		AACSR, 24 single mode ITU-T G.655 optical fibre	275 / 500
Jiangsu Tongguang Optical Fiber Cable Co Ltd	China	AACSR, 24 single mode ITU-T G.652D optical fibre	132 / 275
		AACSR, 24 single mode ITU-T G.655 optical fibre	275 / 500
Jiangsu Zhongtian Technology Co Ltd	China	AACSR, 24 single mode ITU-T G.652D optical fibre	132 / 275
		AACSR, 24 single mode ITU-T G.655 optical fibre	275 / 500

1.3 Optical Fiber Underground Cable (OFUC)

Manufacturer	Country of Manufacturer	Model / Type	Voltage Rated (kV)
Opcom Cables Sdn Bhd	Malaysia	Non-metallic construction, 24 single mode ITU-T G.652D optical fibre	132 / 275
		Non-metallic construction, 24 single mode ITU-T G.655 optical fibre	275 / 500
Jiangsu Tongguang Optical Fiber Cable Co Ltd	China	Non-metallic construction, 24 single mode ITU-T G.652D optical fibre	132 / 275
		Non-metallic construction, 24 single mode ITU-T G.655 optical fibre	275 / 500
Jiangsu Zhongtian Technology Co Ltd	China	Non-metallic construction, 24 single mode ITU-T G.652D optical fibre	132 / 275
		Non-metallic construction, 24 single mode ITU-T G.655 optical fibre	275 / 500
Prysmian Wuxi Cable Company Ltd	China	Non-metallic construction, 24 single mode ITU-T G.652D optical fibre	132 / 275

1.4 Line Fittings & Accessories

Manufacturer	Country of Manufacturer	Model / Type	Voltage Rated (kV)
Dulhunty Power (Malaysia) Sdn Bhd	Malaysia	Suspension set Tension set Braced Post set Accessories	132 / 275
RIBE Power Malaysia Sdn Bhd	Malaysia	Suspension set Tension set Accessories	275 / 500
Preformed Line Products (Malaysia) Sdn Bhd	Malaysia	Suspension set Tension set Accessories	132 / 275
Mosdorfer (Thailand) Co Ltd	Thailand	Suspension set Tension set Accessories	132 / 275
Jiangsu Shuanghui Power Development Co Ltd	China	Suspension set Tension set Accessories	132 / 275
Jiangsu Zhongtian Technology Co Ltd	China	Suspension set Tension set Accessories	132 / 275
PT Preformed Line Products Indonesia	Indonesia	Suspension set Tension set Accessories	132 / 275

1.5 OPGW Fittings & Accessories

Manufacturer	Country of Manufacturer	Model / Type	Voltage Rated (kV)
Dulhunty Power (Malaysia) Sdn Bhd	Malaysia	Suspension set Tension set Accessories	132 / 275
RIBE Power Malaysia Sdn Bhd	Malaysia	Suspension set Tension set Accessories	275 / 500
Preformed Line Products (Malaysia) Sdn Bhd	Malaysia	Suspension set Tension set Accessories	132 / 275
RIBE Joining Technologies (Shanghai) Ltd	China	Suspension set Tension set Accessories	132 / 275 / 500
Jiangsu Shuanghui Power Development Co Ltd	China	Suspension set Tension set Accessories	132 / 275
Jiangsu Zhongtian Technology Co Ltd	China	Suspension set Tension set Accessories	132 / 275
PT Preformed Line Products Indonesia	Indonesia	Suspension set Tension set Accessories	132 / 275

1.6 Insulators

Manufacturer	Country of Manufacturer	Model / Type	Voltage Rated (kV)														
NGK Insulators Ltd	Japan	1. Porcelain insulators for 132kV Transmission Lines:	132 / 275 / 500														
		<table><tr><th>Model/Type</th><th>Rated Strength (kN)</th></tr><tr><td>CA-501MZ</td><td>80 - normal</td></tr><tr><td>CA-825MZ</td><td>80 - fog</td></tr><tr><td>CA-501EZ</td><td>120 - normal</td></tr><tr><td>CA-501EY</td><td>120 - normal</td></tr><tr><td>CA-825EZ</td><td>120 - fog</td></tr><tr><td>CA-825EY</td><td>120 - fog</td></tr></table>		Model/Type	Rated Strength (kN)	CA-501MZ	80 - normal	CA-825MZ	80 - fog	CA-501EZ	120 - normal	CA-501EY	120 - normal	CA-825EZ	120 - fog	CA-825EY	120 - fog
		Model/Type		Rated Strength (kN)													
		CA-501MZ		80 - normal													
		CA-825MZ		80 - fog													
		CA-501EZ		120 - normal													
		CA-501EY		120 - normal													
		CA-825EZ		120 - fog													
		CA-825EY		120 - fog													
		2. Porcelain insulators for 275kV Transmission Lines:															
		<table><tr><th>Model/Type</th><th>Rated Strength (kN)</th></tr><tr><td>CA-501MZ</td><td>80 - normal</td></tr><tr><td>CA-825MZ</td><td>80 - fog</td></tr><tr><td>CA-501EZ</td><td>120 - normal</td></tr><tr><td>CA-501EY</td><td>120 - normal</td></tr><tr><td>CA-825EZ</td><td>120 - fog</td></tr><tr><td>CA-825EY</td><td>120 - fog</td></tr></table>		Model/Type	Rated Strength (kN)	CA-501MZ	80 - normal	CA-825MZ	80 - fog	CA-501EZ	120 - normal	CA-501EY	120 - normal	CA-825EZ	120 - fog	CA-825EY	120 - fog
		Model/Type		Rated Strength (kN)													
		CA-501MZ		80 - normal													
		CA-825MZ		80 - fog													
		CA-501EZ		120 - normal													
CA-501EY	120 - normal																
CA-825EZ	120 - fog																
CA-825EY	120 - fog																
3. Porcelain insulators for 500kV Transmission Lines:																	
<table><tr><th>Model/Type</th><th>Rated Strength (kN)</th></tr><tr><td>CA-580EY</td><td>160 - normal</td></tr><tr><td>CA-833EY</td><td>160 – fog</td></tr><tr><td>CA-589EZ</td><td>210 – normal</td></tr><tr><td>CA-845EZ</td><td>210- fog</td></tr></table>	Model/Type	Rated Strength (kN)	CA-580EY	160 - normal	CA-833EY	160 – fog	CA-589EZ	210 – normal	CA-845EZ	210- fog							
Model/Type	Rated Strength (kN)																
CA-580EY	160 - normal																
CA-833EY	160 – fog																
CA-589EZ	210 – normal																
CA-845EZ	210- fog																
Sediver S.p.A	Italy	1. Toughened glass insulators for 132kV Transmission Lines:	132 / 275 / 500														
		<table><tr><th>Model/Type</th><th>Rated Strength (kN)</th></tr><tr><td>F100/164DC</td><td>100 - normal</td></tr><tr><td>F100P/146DC</td><td>100 - fog</td></tr><tr><td>F12/146DC</td><td>120 - normal</td></tr><tr><td>F120P/146DC</td><td>120 - fog</td></tr></table>		Model/Type	Rated Strength (kN)	F100/164DC	100 - normal	F100P/146DC	100 - fog	F12/146DC	120 - normal	F120P/146DC	120 - fog				
		Model/Type		Rated Strength (kN)													
		F100/164DC		100 - normal													
		F100P/146DC		100 - fog													
		F12/146DC		120 - normal													
		F120P/146DC		120 - fog													
		2. Toughened glass insulators for 275kV Transmission Lines:															
		<table><tr><th>Model/Type</th><th>Rated Strength (kN)</th></tr><tr><td>F100/164DC</td><td>100 - normal</td></tr><tr><td>F100P/146DC</td><td>100 - fog</td></tr><tr><td>F12/146DC</td><td>120 - normal</td></tr><tr><td>F120P/146DC</td><td>120 - fog</td></tr></table>		Model/Type	Rated Strength (kN)	F100/164DC	100 - normal	F100P/146DC	100 - fog	F12/146DC	120 - normal	F120P/146DC	120 - fog				
		Model/Type		Rated Strength (kN)													
		F100/164DC		100 - normal													
		F100P/146DC		100 - fog													
		F12/146DC		120 - normal													
		F120P/146DC		120 - fog													

Manufacturer	Country of Manufacturer	Model / Type	Voltage Rated (kV)																												
		3. Toughened glass insulators for 500kV Transmission Lines: <table><tr><th>Model/Type</th><th>Rated Strength (kN)</th></tr><tr><td>F160/170DC</td><td>160 - normal</td></tr><tr><td>F160P/170DC</td><td>160 – fog</td></tr><tr><td>F21/170DC</td><td>210 – normal</td></tr><tr><td>F210P/170DC</td><td>210 – fog</td></tr></table>	Model/Type	Rated Strength (kN)	F160/170DC	160 - normal	F160P/170DC	160 – fog	F21/170DC	210 – normal	F210P/170DC	210 – fog																			
Model/Type	Rated Strength (kN)																														
F160/170DC	160 - normal																														
F160P/170DC	160 – fog																														
F21/170DC	210 – normal																														
F210P/170DC	210 – fog																														
Sediver Insulators Shanghai Co. Ltd.	China	1. Toughened glass insulators for 132kV Transmission Lines: <table><tr><th>Model/Type</th><th>Rated Strength (kN)</th></tr><tr><td>F100/146DC</td><td>100 - normal</td></tr><tr><td>F100P/146DC</td><td>100 - fog</td></tr><tr><td>F12/146DC</td><td>120 - normal</td></tr><tr><td>F120P/146DC</td><td>120 - fog</td></tr></table> 2. Toughened glass insulators for 275kV Transmission Lines: <table><tr><th>Model/Type</th><th>Rated Strength (kN)</th></tr><tr><td>F100/146DC</td><td>100 - normal</td></tr><tr><td>F100P/146DC</td><td>100 - fog</td></tr><tr><td>F12/146DC</td><td>120 - normal</td></tr><tr><td>F120P/146DC</td><td>120 – fog</td></tr><tr><td>F160/146DC</td><td>160 – normal</td></tr><tr><td>F160P/146DC</td><td>160 – fog</td></tr></table>	Model/Type	Rated Strength (kN)	F100/146DC	100 - normal	F100P/146DC	100 - fog	F12/146DC	120 - normal	F120P/146DC	120 - fog	Model/Type	Rated Strength (kN)	F100/146DC	100 - normal	F100P/146DC	100 - fog	F12/146DC	120 - normal	F120P/146DC	120 – fog	F160/146DC	160 – normal	F160P/146DC	160 – fog	132 / 275				
Model/Type	Rated Strength (kN)																														
F100/146DC	100 - normal																														
F100P/146DC	100 - fog																														
F12/146DC	120 - normal																														
F120P/146DC	120 - fog																														
Model/Type	Rated Strength (kN)																														
F100/146DC	100 - normal																														
F100P/146DC	100 - fog																														
F12/146DC	120 - normal																														
F120P/146DC	120 – fog																														
F160/146DC	160 – normal																														
F160P/146DC	160 – fog																														
Dalian Insulator Group T&D Co., Ltd.	China	1. Porcelain disc insulators for 132kV Transmission Lines: <table><tr><th>Model/Type</th><th>Rated Strength (kN)</th></tr><tr><td>Three Arrows:</td><td></td></tr><tr><td>U100BL</td><td>100 - normal</td></tr><tr><td>U100BLP</td><td>100 - fog</td></tr><tr><td>U120BL</td><td>120 - normal</td></tr><tr><td>U120BLP</td><td>120 - fog</td></tr></table> 2. Porcelain disc insulators for 275kV Transmission Lines: <table><tr><th>Model/Type</th><th>Rated Strength (kN)</th></tr><tr><td>Three Arrows:</td><td></td></tr><tr><td>U100BL</td><td>100 - normal</td></tr><tr><td>U100BLP</td><td>100 - fog</td></tr><tr><td>U120BL</td><td>120 - normal</td></tr><tr><td>U120BLP</td><td>120 – fog</td></tr><tr><td>U160BS</td><td>160 – normal</td></tr><tr><td>U160BSP</td><td>160 – fog</td></tr></table>	Model/Type	Rated Strength (kN)	Three Arrows:		U100BL	100 - normal	U100BLP	100 - fog	U120BL	120 - normal	U120BLP	120 - fog	Model/Type	Rated Strength (kN)	Three Arrows:		U100BL	100 - normal	U100BLP	100 - fog	U120BL	120 - normal	U120BLP	120 – fog	U160BS	160 – normal	U160BSP	160 – fog	132 / 275
Model/Type	Rated Strength (kN)																														
Three Arrows:																															
U100BL	100 - normal																														
U100BLP	100 - fog																														
U120BL	120 - normal																														
U120BLP	120 - fog																														
Model/Type	Rated Strength (kN)																														
Three Arrows:																															
U100BL	100 - normal																														
U100BLP	100 - fog																														
U120BL	120 - normal																														
U120BLP	120 – fog																														
U160BS	160 – normal																														
U160BSP	160 – fog																														

APPENDIX A – STL MEMBERS LABORATORIES

STL Member	Member Laboratories	Country
Intertek (ASTA)	Testing & Certification Australia Lane Cove Testing Station	Sydney, Australia
KEMA	KEMA Testing, Inspections & Certification High Power Laboratory	AR Arnhem, The Netherlands
	KEMA Testing, Inspections & Certification KEMA High-Voltage Laboratory	AR Arnhem, The Netherlands
	KEMA Testing, Inspections & Certification KEMA – Powertest Inc	Chalfont, USA
CESI	CESI Centro Elettrotecnico Sperimentale Italiano S.p.A.	Milano MI, Italy
	Institut “Prieffeld für elektrische Hochleitungstechnik” GmbH (IPH)	Berlin, Germany
	FGH Engineering & Test GmbH	Mannheim, Germany

KERI	High Power High Voltage Testing & Evaluation Division in Main Office	Gyeongangnam, South Korea
	Power Apparatus Testing & Evaluation Division in Ansan office Korea Electrotechnology Research Institute	Gyeonggi-do, South Korea
CPRI	Central Power Research Institute Central Research & Testing Laboratory (CRTL)	Bangalore, India
	Central Power Research Institute Switchgear Testing & Development Station (STDS)	Bhopal, India
	Central Power Research Institute UHV Research Laboratory (UHVRL)	Hyderabad, India
PEHLA	ABB Switzerland Ltd. High Voltage Products and Components, Dept. PTHX	Baden, Switzerland
	High-Voltage Institute Kassel	Kassel, Germany

	GE Grid Solutions GmbH	
	ABB AG Calor Emag Medium Voltage Products	Ratingen, Germany
	FGH Engineering & Test GmbH	Mannheim, Germany
	Institut „Prueffeld fur elektrische Hochleistungstechnik“ GmbH (IPH)	Berlin, Germany
	Siemens AG	Berlin, Germany
	Siemens AG	Frankfurt am Main, Germany
SATS	ABB AB	Ludvika, Sweden
	STRI AB	Ludvika, Sweden
	NEXANS Norway AS	Halden, Norway
	NEFI	Skien, Norway
ESEF	Laboratoires des Matériels Electriques (LME), Site des Renardieres, EDF-R&D-LME	Moret-sur-Loing Cedex, France
	Centre d'Essais Rhodanien De l'Appareillage, CERDA, GE Grid Solutions	Villeurbanne Cedex, France

	L2E VOLTA, Schneider Electric Industries SAS	Grenoble Cedex 9, France
JSTC	Central Research Institute of Electric Power Industry CRIEPI	Kanagawa, Japan
	Japan AE Power Systems Corp. Kokubu High Power Laboratory 1-1, Kokubu-cho	Ibaragi, Japan
	Japan AE Power Systems Corp. Numazu High Power Laboratory	Shizuoka, Japan
	Mitubishi Electric Corp. High Voltage & High Power Testing Laboratories	Hyogo, Japan
	High Voltage and High Power Testing Laboratory Nissin Electric Co., Ltd	Kyoto, Japan
	Toshiba Corp. Hamakawasaki High Voltage and High Power Testing Laboratory	Kanagawa, Japan
STLNA	Powertech Laboratories Inc.	British Columbia, Canada
		Franksville, USA

	Cooper Power Systems – High Power Lab	
	KEMA PowerTest Inc.	Chalfont, USA
	Eaton Corp.	Pittsburgh, USA
	LAPEM-CFE	Irapuato, GTO Mexico
	S&C Electric Company	Chicago, USA
	AREVA T&D BRASIL	Minas Gerais, Brasil
VEIKI-VNL	VEIKI-VNL Electric Large laboratories Ltd	Budapest, Hungary
ZKU	ZKU, Zkušebnictví, a.s. Czech Republic	Czech Republic
	ZKU Member Laboratories Zkušebnictví, a.s. (ZKU) Czech Republic	