



# **LIST OF MATERIALS**

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

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## DISCLAIMER

Every effort has been made to ensure the accuracy of this document. However, in case of discrepancies, records of Asset Engineering Division are the authoritative source.

## **PREFACE**

This list supersedes all preceding issues including revisions. Revised sheets reflecting changes in the list will be issued quarterly and should be inserted in order to keep your copy up to date.

The items shown in this publication include material and equipment for distribution facilities. Items not listed include office equipment, tools and work equipment, items of electric general plant and consumer owned wiring facilities.

In addition to items accepted on a general basis, this list also includes items accepted on a conditional basis. As one of the conditions in the acceptance of an item on a conditional basis, suppliers are required to obtain the company's concurrence prior to its use.

Any supplier/manufacturer who desire to have their items placed on the list, or any user believing an existing item should be removed from the list, or any communication calling attention to an error or omission in the list, such as a wrong catalog number, an obsolete item, etc, should address to:

**Chief Executive Officer  
SARAWAK ENERGY BERHAD  
Menara Sarawak Energy  
No. 1, The Isthmus,  
93050 Kuching, Sarawak, MALAYSIA  
Tel No.: +6 082-388388  
Fax No.: +6 082-481811 / +6 082-344433**

**Attention: Asset Management APL Secretary [Senior Manager (Asset Engineering)]**

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## 1.0 SUBSTATION EQUIPMENT

### 1.1 Pillar

#### 1.1.1 7W6F Distribution Pillar

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Teknix Electrical & Electronic Sdn Bhd, Kuching	-	Malaysia
Spanners International, S'pore / Spanners Engineering, M'sia	-	Singapore / Malaysia
Tamco System (M) Sdn Bhd	-	Malaysia

#### 1.1.2 LV 4-Way Mini Pillar (DIN)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Spanners International, S'pore / Spanners Engineering, M'sia	-	Singapore / Malaysia
Tamco System (M) Sdn Bhd	-	Malaysia
Sun System Eng. Sdn Bhd, M'sia	-	Malaysia
Teknix Electrical & Electronic Sdn Bhd, Kuching	-	Malaysia
Tenaga Kenari	-	Malaysia

### 1.2 RMU

#### 1.2.1 11 kV Oil RMU

(Obsolete and any new RMU shall be SF6 insulated)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
CG Lucy	Trident	India
Lucy Switchgear FZE	Trident	Dubai, UAE
Lucy Switchgear	Trident	U.K.

#### 1.2.2 11 kV SF6 RMU

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
<sup>(1)</sup> Schneider Electric Ltd & Schneider Electric (M) Sdn Bhd	Ringmaster C (21 kA version)	U.K & Malaysia
<sup>(1)</sup> <b>Note:</b> (a) Model with rated voltage of 13.8 kV shall be supplied in order to achieve the required BIL. (b) Pressure relief facility, mechanical trip push button and voltage present indicators (for ring switches) shall be provided.		

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
<sup>(2)</sup> Schneider Electric (M) Sdn Bhd, Selangor	RM6	France & Malaysia
<sup>(2)</sup> <b>Note:</b> (a) Model with rated voltage of 13.8 kV shall be supplied in order to achieve the required BIL (b) Gas tank shall be manufactured by Schneider (France) (c) Restricted to indoor substations (with enclosure) and compact substations (d) Screened type separable connectors shall be used for the connection to the cables.		
<sup>(3)</sup> Tamco Corporate Holdings Sdn Bhd, Selangor	GR1	Malaysia
<sup>(3)</sup> <b>Note:</b> (a) Stainless steel gas tank and internal arc explosion valve shall be provided. (b) Restricted to 2 models, ie. GR1-21 & GR1-31.		
<sup>(4)</sup> Lucy Switchgear	15.5 kV SF6 RMU Sabre	Dubai, UAE & Malaysia
<sup>(4)</sup> <b>Note:</b> (a) Only accept 15.5 kV RMU instead of 12 kV RMU for achieving 95kV BIL. (b) Dual ratio CT (100/50/5) shall be provided in order to cater for transformer size ranging from 200 kVA to 1500 kVA. (c) Voltage indicator and temperature compensated pressure gauge shall be provided. (d) For Malaysia factory, the RMU shall be manufactured by Sun Systems Engineering(SSE) under license by Lucy Switchgear		

### 1.3 Switchgear

#### 1.3.1 11 kV AIS Switchgear

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Siemens (Partial GIS)	NX PLUS-C	Germany
ABB	Unigear ZS Series	Malaysia
Tamco	VK Series	Malaysia
Xiamen Huadian Switchgear Co Ltd	Gelpag AMS Series	China
Toshiba	HV12	Malaysia

### 1.3.2 33 kV GIS Switchgear

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Siemens	8D Series	Germany/China
ABB	ZX Series	Germany/ Malaysia
Areva	WS Series	Germany/ Malaysia
Tamco	GV3	Malaysia

## 1.4 Transformer

### 1.4.1 11/.433 kV Distribution Transformer

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
ABB	-	Singapore/ Vietnam
AICHI	-	Japan
Arab-Malaysia SGB	-	Malaysia
Charoenchai	-	Thailand
Ekarat	-	Thailand
Emo Ohrid	-	Yugoslavia
EWT	-	Malaysia
MTM	-	Malaysia
SESCO-Efacec	-	Malaysia
South Wales	-	U.K.
Thai Trafo	-	Thailand
Toshiba	-	Japan
Tirathai	-	Thailand
Toshiba Transmission & Distribution Systems	-	India
Shihlin	-	Taiwan
B&D	-	Indonesia
<b>Remarks:</b> Standard Ratings: 1 phase – 25kVA & 50kVA (11/.250kV) 3 phase – 50kVA, 160kVA, 300kVA, 500kVA, 1000kVA, 1500kVA		

### 1.4.2 33/.433 kV Distribution Transformer

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
ABB	-	Singapore / Australia / Vietnam
AICHI	-	Japan
Arab-Malaysia SGB	-	Malaysia
Charoenchai	-	Thailand
Ekarat	-	Thailand
EWT	-	Malaysia



<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
MTM	-	Malaysia
Tirathai	-	Thailand
Shihlin	-	Taiwan
Toshiba	-	India
<b>Remarks:</b> Standard Ratings: 50kVA, 160kVA, 300kVA, 500kVA, 1000kVA		

#### 1.4.3 33/11 kV Distribution Transformer

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
ABB	-	Australia / Singapore / Vietnam
Charoenchai	Up to 2.5 MVA	Thailand
Ekarat	Up to 1 MVA	Thailand
MTM	-	Malaysia
Tirathai	-	Thailand
EWT	Up to 2.5 MVA	Malaysia
Shihlin	-	Taiwan
Tatung	-	Taiwan
<b>Remarks:</b> Standard Ratings: 1 MVA, 2.5 MVA, 5 MVA		

#### 1.4.4 33/11 kV ONAN / ONAF Power Transformer c/w OLTC

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
ALSTOM	-	Turkey
ABB	-	Australia / Sweden/ Turkey/ Thailand/ Vietnam
AICHI	-	Japan
Daihen	-	Thailand
MTM	-	Malaysia
Tirathai	-	Thailand
Meidensha/Hitachi/Fuji	-	Japan
Mitsubishi/Toshiba	-	Japan
Takaoka	-	Japan
SGB	-	Germany
Efacec	-	Portugal
Areva	-	Turkey
BEST	-	Turkey
Hyundai	-	Korea
New Korea	-	Korea
Xian	-	China

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Koncar	-	Croatia
Shihlin	-	Taiwan
Tatung	-	Taiwan
<b>Remarks:</b> Standard Ratings: 5MVA, 10/15 MVA, 20/25 MVA		

## 1.5 Neutral Earthing Resistor (NER)

### 1.5.1 11kV Neutral Earthing Resistor (NER)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Any Ohm Sdn. Bhd.	AO1116/ AO1108	Malaysia
Pestech Sdn Bhd	RES	Malaysia
M.S. Resistances S.A.S.	11kV-1600A-4 Ohm- 10 Sec/ 11kV-800A-8 Ohm-10 Sec	France

## 2.0 UNDERGROUND EQUIPMENT

### 2.1 Termination Kits

#### 2.1.1 LV Termination Kit, Indoor/Outdoor

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Sucofit/Tyco	Heat Shrink	Switzerland
Raychem/Tyco	Heat Shrink	U.S.A./ Germany
Cellpack	Heat Shrink	Switzerland/ Germany
Nexans	Heat Shrink	Italy
Changyuan Group (CYG)	Heat Shrink	China
3M	Heat Shrink	India
Hongshang Heat Shrinkable	Heat Shrink	China

#### 2.1.2 11 kV Termination Kit, Indoor/Outdoor

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Cellpack	Hybrid Heat- Shrinkable	Switzerland/ Germany
Sucofit/Tyco	Heat Shrink	Switzerland
Raychem/Tyco	Heat Shrink	U.S.A./ Germany
3M	Cold Shrink	Malaysia
Nexans	Heat Shrink	Italy
Nexans	Cold Shrink	France
Prysmian	Cold Shrink	France
Changyuan Group (CYG)	Heat Shrink	China
Changyuan Group (CYG)	Cold Shrink	China

2.1.3 33 kV Termination Kit, Indoor/Outdoor

Manufacturer	Type/Catalogue/ Model No.	Country of Manufacture
Raychem/Tyco	Heat Shrink	U.S.A./ Germany
3M	Cold Shrink	Malaysia
Cellpack	Hybrid Heat- Shrinkable	Switzerland/ Germany
Nexans	Heat Shrink	Italy
Prysmian	Cold Shrink	France
Changyuan Group (CYG)	Cold Shrink	China

2.1.4 11/33 kV Straight Through and Transition Joint Kits

Manufacturer	Type/Catalogue/ Model No.	Country of Manufacture
Raychem/Tyco	Heat Shrink	U.S.A./ Germany
Cellpack	Resin/Tapping	Switzerland/ Germany
<sup>(1)</sup> ABB Kabeldon	Resin/Tapping	Sweden
<sup>(1)</sup> <b>Note:</b> Only accept ABB Kabeldon GHL 1500 two-component polyurethane based resin complete with approved type fibre box.		
3M	Cold Shrink (Premoulded with Resin)/Tape-Resin	Malaysia
Cellpack	Hybrid Heat- Shrinkable	Switzerland/ Germany
Nexans	Heat Shrink	Italy
<sup>(2)</sup> Nexans	Cold Shrink	France
<sup>(2)</sup> <b>Note:</b> Only for 11kV.		
Prysmian	Cold Shrink	France
<sup>(3)</sup> Changyuan Group (CYG)	Heat Shrink	China
<sup>(3)</sup> <b>Note:</b> Only for 11kV.		
Changyuan Group (CYG)	Cold Shrink	China

2.1.5 11kV Separable connector

Manufacturer	Type/Catalogue/ Model No.	Country of Manufacture
Cooper Electronic Technology Shanghai Co.	DTS*, DTB* & DT400	China
Cellpack	-	Malaysia
Nexans - Euromold	-	Belgium
CYG	CJB10-630 & CJB10-200	China
Raychem/Tyco	RSTI	Germany

### 2.1.6 Plug In Termination for 33kV GIS

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Pfisterer	-	Germany/Italy
Sudkabel	-	Germany
Tyco Electronics Raychem GmbH	-	Germany

## 2.2 **Underground Cable**

### 2.2.1 LV XLPE Cable

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Central Cable (M) Bhd, Melaka.	-	Malaysia
Fujikura Federal Cables Sdn Bhd	-	Malaysia
FEC Cables (M) Sdn Bhd, Selangor	-	Malaysia
Olympic Cable Co. Sdn Bhd, Melaka	-	Malaysia
Universal Cable (M) Sdn Bhd, Johor	-	Malaysia
Universal Cable (S) Sdn Bhd/ Sarawak Cable Sdn Bhd	-	Malaysia
Wonderful Wire & Cable Bhd, Johor	-	Malaysia
Mitti Power Cables Sdn. Bhd, Johor	-	Malaysia
Leader Cable Industry Bhd	-	Malaysia
Tai Sin Electric Cables (M) Sdn Bhd	-	Malaysia
Southern Cable	-	Malaysia
Power Cables Malaysia Sdn Bhd	-	Malaysia
Mega Kabel Sdn Bhd	-	Malaysia
Master Tec Wire & Cable Sdn Bhd	-	Malaysia
Draka (Malaysia) Sdn. Bhd.	-	Malaysia
Hi-Essence Cable Sdn. Bhd.	-	Malaysia

### 2.2.2 11 kV XLPE Cable

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Central Cable (M) Bhd, Melaka.	-	Malaysia
Federal Power Sdn Bhd, Selangor	-	Malaysia
Fujikura Federal Cables Sdn Bhd	-	Malaysia
FEC Cables (M) Sdn Bhd, Selangor	-	Malaysia
Leader Cable Industry Bhd, Penang	-	Malaysia
Olympic Cable Co. Sdn Bhd, Melaka	-	Malaysia
Power Cables Malaysia Sdn Bhd	-	Malaysia
Tenaga Cable Industries Sdn Bhd	-	Malaysia
Universal Cable (M) Sdn Bhd, Johor	-	Malaysia
PT VOKSEL Electric Tbk	-	Indonesia
Southern Cable	-	Malaysia

### 2.2.3 33 kV XLPE Cable

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Central Cable (M) Bhd, Melaka	-	Malaysia
Federal Power Sdn. Bhd, Selangor	-	Malaysia
Fujikura Federal Cables Sdn Bhd	-	Malaysia
FEC Cables (M) Sdn Bhd, Selangor	-	Malaysia
Leader Cable Industry Bhd, Penang	-	Malaysia
Power Cables Malaysia Sdn Bhd	-	Malaysia
Olympic Cable Co. Sdn Bhd	-	Malaysia
Universal Cable (M) Sdn Bhd, Johor	-	Malaysia
Southern Cable	-	Malaysia
Tenaga Cable Industries Sdn Bhd	-	Malaysia

### 2.2.4 11 kV and 33 kV Submarine Cable

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
LS Cable	-	Korea
Sumitomo Electric Industries (SEI)	-	Japan
OLEX Australia Pty Ltd	-	Australia
SWCC Showa Cable Systems Co., Ltd	-	Japan
Leader Cable Industry Bhd, Penang	-	Malaysia
Power Cables Malaysia Sdn Bhd	-	Malaysia
Zhongtian Technology Submarine Cable Co. Ltd	-	China
Hengtong Optic-Electric Co. Ltd	-	China

## 2.3 **Link Boxes**

### 2.3.1 33kV 3+1 Way Link Box c/w SVL

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
AK POWER SOLUTION	-	Australia
Evergrow Electrical Engineering Sdn Bhd	-	Malaysia
<sup>(1)</sup> Team Force Engineering	-	Malaysia
<sup>(1)</sup> <b>Note:</b> Approved for ground-mounted link box only.		
Pfisterer	-	Italy

## 3.0 **OVERHEAD EQUIPMENT**

### 3.1 **ABI and Switches**

#### 3.1.1 11 kV 400A 3-Phase Outdoor ABI Switch (On Load/Off Load)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
ABB	R3808D	Australia
Lucy Switchgear	Rapier RX	Dubai
S & C	Alduti Rupter	Canada
Lucy Switchgear	Rapier AX	Dubai
AB GEVEA	GEVEA	Sweden
S&C Electric Company	Omni-Rupter	China

### 3.1.2 33 kV 400A 3-Phase Outdoor ABI Switch (On Load/Off Load)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
ABB	R10508D-P	Australia
Lucy Switchgear	Rapier RX	Dubai
S & C	Alduti Rupter	Canada
AB GEVEA	GEVEA	Sweden

## 3.2 **Conductor**

### 3.2.1 Simalec Conductor (AAAC)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Consolidated Cable	-	Malaysia
Federal Power Sdn Bhd, Selangor	-	Malaysia
Fujikura Federal Cables Sdn Bhd	-	Malaysia
Tenaga Cable Industries Sdn Bhd	-	Malaysia
Universal Cable (M) Sdn Bhd, Johor	-	Malaysia
Universal Cable (S) Sdn Bhd/ Sarawak Cable Sdn Bhd	-	Malaysia
Power Cables Malaysia Sdn Bhd	-	Malaysia
Southern Cable	-	Malaysia
Leader Cable Industry Bhd, Penang	-	Malaysia
Central Cable (M) Bhd, Melaka	-	Malaysia

### 3.2.2 HV Aerial Bundle Cable

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Central Cable (M) Bhd, Melaka.	-	Malaysia
Federal Power Sdn Bhd, Selangor	-	Malaysia
Fujikura Federal Cables Sdn Bhd	-	Malaysia
FEC Cables (M) Sdn Bhd	-	Malaysia
Leader Cable Industry Bhd, Penang	-	Malaysia
Olympic Cable Co Sdn Bhd, Melaka	-	Malaysia
Tenaga Cable Industries Sdn Bhd	-	Malaysia
Universal Cable (M) Sdn Bhd, Johor	-	Malaysia
Power Cables Malaysia Sdn Bhd	-	Malaysia
Southern Cable	-	Malaysia

### 3.2.3 LV Aerial Bundled Cable

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Central Cable (M) Bhd, Melaka.	-	Malaysia
Federal Power Sdn Bhd, Selangor	-	Malaysia
Fujikura Federal Cables Sdn Bhd	-	Malaysia
FEC Cables (M) Sdn Bhd	-	Malaysia
Leader Cable Industry Bhd, Penang	-	Malaysia
Olympic Cable Co Sdn Bhd, Melaka	-	Malaysia
Tenaga Cable Industries Sdn Bhd	-	Malaysia
Universal Cable (M) Sdn Bhd, Johor	-	Malaysia
Power Cables Malaysia Sdn Bhd	-	Malaysia
Southern Cable	-	Malaysia
Master Tec Wire & Cable Sdn Bhd	-	Malaysia
Hi-Essence Cable Sdn. Bhd.	-	Malaysia

### 3.2.4 LV PVC Covered Aluminium Conductor

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Universal Cable (M) Sdn Bhd, Johor	-	Malaysia
Universal Cable (S) Sdn Bhd/ Sarawak Cable Sdn Bhd	-	Malaysia
Leader Cable Industry Sdn Bhd, Penang	-	Malaysia
Olympic Cable Co Sdn Bhd, Melaka	-	Malaysia
Tai Sin Electric Cables (M) Sdn Bhd	-	Malaysia
Power Cables Malaysia Sdn Bhd	-	Malaysia
Southern Cable	-	Malaysia
Master Tec Wire & Cable Sdn Bhd	-	Malaysia

## 3.3 **EDO or ABFI**

### 3.3.1 11 kV ABFI 100A 150 MVA with Arc Shortening Rod

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
ABB	Series V, P/No.7502523	Australia
ABB	ICX 27 kV Interchangeable	USA/China
Joongwon Electric Corp.	J&W 80442	Korea
S&C Electric Company	Type XS	U.S.A./China
Gunkul Engineering Public Company Limited	FC2710012	Thailand



### 3.3.2 33 kV ABFI 100A 150 MVA with Arc Shortening Rod

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
ABB	Series V, P/No.7502520	Australia
ABB	ICX 38 kV Interchangeable	USA/China
Joongwon Electric Corporation	J&W 80445	Korea
S&C Electric Company	Type XS	U.S.A./China
Gunkul Engineering Public Company Limited	FC3810010	Thailand

## 3.4 Insulator

### 3.4.1 11 kV Pin Insulator, Brown, Glazed

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
NGK	HRAA-168N	Japan
<sup>(1)</sup> Shandong-Zibo	DK10023	China
<sup>(2)</sup> TE Connectivity	-	China
<sup>(3)</sup> Dalian Insulator (Fujian) Co. Ltd	DK10023	China
<sup>(1)(2)(3)</sup> <b>Note:</b> Tracking number (TP No.) is required before production and each batch of insulators shall be subjected to FAT.		

### 3.4.2 33 kV Pin Insulator, Brown, Glazed

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
NGK	HRAA-302Q	Japan
<sup>(1)</sup> Shandong-Zibo	DK10025	China
<sup>(2)</sup> TE Connectivity	-	China
<sup>(3)</sup> Dalian Insulator (Fujian) Co. Ltd	DK10025	China
<sup>(1)(2)(3)</sup> <b>Note:</b> Tracking number (TP No.) is required before production and each batch of insulators shall be subjected to FAT.		

### 3.4.3 Shackle/Spool Insulator

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Dalian Ceramic Technic Co Ltd	CTC	China
Shandong Zibo	-	China
TE Connectivity	-	China
Fujian Hoshing Proper Electrical Porcelain Co Ltd	-	China
Bonle Mingqing	-	China

#### 3.4.4 Suspension Insulator

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
<sup>(1)</sup> Dalian Porcelain Insulator Works	XP-70 (52-3)	China
NGK	Cat.No.CA-515BB	Japan
NGK	Cat.No.CA-515BB & CA-515B7	China
<sup>(2)</sup> Shandong Zibo	XP-70 (52-3)	China
<sup>(3)</sup> TE Connectivity	-	China
<sup>(4)</sup> Suzhou Porcelain Insulator Works Co Ltd	-	China
<sup>(5)</sup> Dalian Insulator (Fujian) Co. Ltd	XP-70	China
<sup>(1)(2)(3)(4)(5)</sup> <b>Note:</b> Tracking number (TP No.) is required before production and each batch of insulators shall be subjected to FAT.		

#### 3.4.5 Stay Insulator

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Dalian Insulator Co	-	China
Dalian Ceramic Technic Co Ltd	-	China
Shandong Zibo	-	China
TE Connectivity	-	China
Fujian Hoshing Proper Electrical Porcelain Co Ltd	-	China
Bonle Mingqing	-	China

#### 3.4.6 33 kV Pin Post Insulator (200kV BIL)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
NGK	-	Japan
<sup>(1)</sup> Suzhou Porcelain Insulator Works Co. Ltd.	-	China
<sup>(2)</sup> Dalian Insulator (Fujian) Co. Ltd	-	China
<sup>(1)(2)</sup> <b>Note:</b> Tracking number (TP No.) is required before production and each batch of insulators shall be subjected to FAT.		

### 3.5 Overhead Connectors

#### 3.5.1 Aluminium PG Clamp

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Karl Pfisterer Stuttgart	-	Germany
Max Hellstern GmbH	-	Germany
Yongjiu Electric Power Fitting Co Ltd	-	China
SICAME	-	China

#### 3.5.2 Bi-metal PG Clamp

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Karl Pfisterer Stuttgart	-	Germany
Max Hellstern GmbH	-	Germany
Yongjiu Electric Power Fitting Co Ltd	-	China

#### 3.5.3 Insulation Piercing Connector

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Karl Pfisterer Stuttgart	-	Germany
Max Hellstern GmbH (Tyco)	-	Germany
ENSTO	-	Finland
SICAME	-	France
Simel (Tyco)	-	France
Michaud	-	France

#### 3.5.4 Insulating Shroud suitable for PG Clamp

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Karl Pfisterer Stuttgart	SP8 (Model 499-999- 200)	Germany
ENSTO	SP 16	Finland
Wenhong Plastic Industry Sdn Bhd	-	Malaysia
Yongjiu Electric Power Fitting Co Ltd	-	China

### 3.6 Poles

#### 3.6.1 Concrete Pole

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
PMW Concrete Industries Sdn Bhd, Perak	-	Malaysia
Smart Crete Sdn Bhd, Sarawak	-	Malaysia
Binaan Desjaya Sdn Bhd	For LV 9 meter pole only	Malaysia
PMW Industries (Sarawak) Sdn Bhd	-	Malaysia

#### 3.6.2 Steel Poles

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Sarwaja Timur Sdn Bhd	-	Malaysia
KKB Engineering Bhd	-	Malaysia
Segenting Bersatu Sdn Bhd	-	Malaysia
Yixing Futao Metal Structure Unit Co Ltd	-	China

### 3.7 Street Lighting and Accessories

#### 3.7.1 SON Ballast, 70W

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Philips (M)	BSN 70W	Malaysia
SE Everlast Sdn Bhd	SONLL 70W (LL-Low Loss)	Malaysia
SOLEX	DLS 70	Malaysia
Nikkon	HPS 70W	Malaysia
Amat Sinar Sdn Bhd	ASL 70S	Malaysia
Tridonic	OGLIS 70W	South Africa
ATCO	-	Australia
REFAS	RB70HS4A-P	Malaysia
ELT	VSI 7/22 3TG	Spain
Muarlite Industries Sdn Bhd	MLSL (B) 70W	Malaysia

#### 3.7.2 SON Ballast, 100W

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Nikkon	HPS/MH 100W	Malaysia
Amat Sinar Sdn Bhd	ASL 100S	Malaysia
ELT	VSI 10/22-3T-G	Spain

### 3.7.3 SON Ballast, 150W

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
SE Everlast Sdn Bhd	SONLL 150W (LL-Low Loss)	Malaysia
SOLEX	DLS 150	Malaysia
ATCO	OSM 150.00	Australia
Nikkon	HPS 150W	Malaysia
Philip (M)	BSN 150W	Malaysia
Amat Sinar Sdn Bhd	ASL 150S	Malaysia
Tridonic	OGLIS 150W	South Africa
REFAS	RB150HS4A-P	Malaysia
ELT	VSI 15 3TG SC	Spain
Muarlite Industries Sdn Bhd	MLSL (B) 150W	Malaysia

### 3.7.4 SON Ballast, 250W

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Philip (M)	BSN 250W	Malaysia
SE Everlast Sdn Bhd	SONLL 250W (LL-Low Loss)	Malaysia
SOLEX	DLS 250	Malaysia
Nikkon	HPS 250W	Malaysia
Amat Sinar Sdn Bhd	ASL 250S	Malaysia
Tridonic	OGLIS 250W	South Africa
ATCO	OG250	Australia
REFAS	RB250HS4A-P	Malaysia
ELT	VSI 25/22 3TG	Spain
Muarlite Industries Sdn Bhd	SURIA 250W	Malaysia

### 3.7.5 SON Lamp, 70W with Built-in Ignitor

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
OSRAM	NAV-E 70W/I	Germany
PHILIPS	SON-E 70W/I	China
EYE Iwasaki	NH 70F/I	Japan

### 3.7.6 SON Lamp, 150W

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
OSRAM	NAV-T 150W	Germany
OSRAM	NAV-T 150W	China
PHILIPS	SON-T 150W	China
EYE Iwasaki	NHT 150	Japan

### 3.7.7 SON Lamp, 250W

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
OSRAM	NAV-T 250W	Germany
OSRAM	NAV-T 250W	China
PHILIPS	SON-T 250W	China
EYE Iwasaki	NHT 250	Japan

### 3.7.8 SON Ignitor

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Amat Sinar Sdn Bhd	S1-2P/ASL SI-SP	Malaysia
BAG Turgi Electronic	Type N1 400NE	Switzerland
EVERLAST	SN1540C-T 70-400W	Malaysia
PHILIPS	SU-70400L	Belgium
THORN	ZRM4 5ES/B2-02	Australia
REFAS by EITA Tech	FCD-G400t <sub>2</sub>	Malaysia
NIKKON	SP9008T	Malaysia
ELT	AVS 400D	Spain
Muarlite Industries Sdn Bhd	MIG 14 (100-400W)	Malaysia

### 3.7.9 SON Lantern, 70W

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Amat Sinar Sdn Bhd	ASL AL 70W ASL-C20 70W	Malaysia
SCHREDER	Z1	Malaysia
NIKKON	S419-150/70W	Malaysia
Primelux Energy Sdn Bhd	CS5	Malaysia
Muarlite Industries Sdn Bhd	MIL 7-70W	Malaysia

### 3.7.10 SON Lantern, 100W

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Amat Sinar Sdn Bhd	ASL-C22 100W	Malaysia
SCHREDER	MC1/NB/100W	Malaysia
NIKKON	S419-150/100W	Malaysia
Muarlite Industries Sdn Bhd	MIL 10-100W	Malaysia

### 3.7.11 SON Lantern, 150W

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Amat Sinar Sdn Bhd	ASL AL 150W ASL-C22-150W ASL-C20 150W	Malaysia
SCHREDER	Z2	Malaysia
NIKKON	S419-150W	Malaysia
<sup>(1)</sup> THORN Lighting (Tianjin) Co Ltd	Alpha 2000 (150W)	China
<sup>(1)</sup> <b>Note:</b> The THORN Street Lighting Lantern shall incorporate a detachable point for unplugging and a set of appropriate control fuse for maintenance and safety purposes.		
Philips	Smartway	Malaysia
Primelux Energy Sdn Bhd	CS7	Malaysia
Muarlite Industries Sdn Bhd	MIL 15-150W	Malaysia

### 3.7.12 SON Lantern, 250W

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Amat Sinar Sdn Bhd	ASL AL 250W ASL-C21-250W ASL-C34 250W	Malaysia
SCHREDER	Z2	Malaysia
NIKKON	S419-250W	Malaysia
<sup>(1)</sup> THORN Lighting (Tianjin) Co Ltd	Alpha 2000 (250W)	China
<sup>(1)</sup> <b>Note:</b> The THORN Street Lighting Lantern shall incorporate a detachable point for unplugging and a set of appropriate control fuse for maintenance and safety purposes.		
Philips	Smartway	Malaysia
Primelux Energy Sdn Bhd	CYGNUS P2	Malaysia
Muarlite Industries Sdn Bhd	MIL 16-250W	Malaysia

### 3.7.13 Street Lighting Bracket

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
GVE Metal Sdn Bhd, Kuching	-	Malaysia
Sarwaja Timur Sdn Bhd	-	Malaysia
KKB Engineering Bhd	-	Malaysia
Segenting Bersatu Sdn Bhd	-	Malaysia
Yixing Futao Metal Structure Unit Co. Ltd	-	China

### 3.7.14 Street Lighting Column

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Sarwaja Timur Sdn Bhd	-	Malaysia
KKB Engineering Bhd	-	Malaysia
Lysaght Galvanised Steel Bhd	-	Malaysia
Galvapole Industries Sdn Bhd	-	Malaysia
Segenting Bersatu Sdn Bhd	-	Malaysia
Yixing Futao Metal Structure Unit Co. Ltd	-	China

## 3.8 **Surge or Lightning Arrester**

### 3.8.1 11 kV Lightning Arrester, 12 kV, 10 kA

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
ABB	-	Switzerland
Eaton Cooper Power System	-	Mexico
HUBBEL/OHIO BRASS	-	U.S.A./China (Wuhu)
Siemens	-	China
ISOELECTRIC	-	Italy
DTR Corporation	-	Korea
Tridelta	-	Germany

### 3.8.2 33 kV Lightning Arrester, 36 kV, 10 kA

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
ABB	-	Switzerland
Eaton Cooper Power System	-	Mexico
HUBBEL/OHIO BRASS	-	U.S.A./China (Wuhu)
Siemens	-	China
ISOELECTRIC	-	Italy
DTR Corporation	-	Korea
Tridelta	-	Germany



### 3.9 Auto Recloser

#### 3.9.1 Auto Recloser 11 kV

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Whipp & Bourne Ltd	GVR 15/12	U.K.
<sup>(1)</sup> Schneider Electric Pty Ltd	N15 (12 kV)	Australia
<sup>(1)</sup> <b>Note:</b> Formerly known as Nu-Lec Pty Ltd (Australia).		
Noja Power Switchgear Pty Ltd	OSM 15-16-630-110- 200 c/w RC-10 controller	Australia
Cooper Electronics Technologies (Shanghai) Co. Ltd	NOVA 15i	China
Entec Electric & Electronic Co. Ltd	EPR-1 (Recloser) & EVRC2A-NT (Controller)	Korea

#### 3.9.2 Auto Recloser 33 kV

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
<sup>(1)</sup> Schneider Electric Pty Ltd	N38 (38 kV)	Australia
<sup>(1)</sup> <b>Note:</b> Formerly known as Nu-Lec Pty Ltd (Australia).		
Whipp & Bourne Ltd	GVR 38/8	U.K.
Noja Power Switchgear Pty Ltd	OSM 38-12.5-630 c/w RC-10 controller	Australia
Cooper Electronics Technologies (Shanghai) Co. Ltd	NOVA 38i recloser with Form 6 / FXD Controller	China
Entec Electric & Electronic Co. Ltd	EPR-3 (Recloser) & EVRC2A-NT (Controller)	Korea

### 3.10 Overhead Assemblies

#### 3.10.1 Stay Wire (7/8 SWG)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Hangzhou Huixin Metal Product Co. Ltd.	-	China
Southern Wire Sdn Bhd	-	Malaysia
Bonisa Resources Sdn Bhd	-	Malaysia

## 4.0 MISCELLANEOUS EQUIPMENT

### 4.1 Cable Connectors

#### 4.1.1 Copper Cable Connectors, Crimping Type

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Conway Terminals Manufacturer Sdn Bhd	-	Malaysia
Supreme & Company, West Bengal	-	India
Utilux	-	Australia
Cembre	-	Italy
Cabac	-	Australia
Simel (Tyco)	-	France
Yongjiu Electric Power Fitting Co Ltd	-	China

#### 4.1.2 Aluminium and Bi-metallic Connectors

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Mosdorfer CCL System Ltd	-	England
Utilux	-	Australia
Cembre	-	Italy
Conway Terminals Manufacturer Sdn Bhd	-	Malaysia
Simel (Tyco)	-	France
Cabac	-	Australia
Yongjiu Electric Power Fitting Co Ltd	-	China

### 4.2 Pipes

#### 4.2.1 HDPE Pipe

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Weidasar Sdn Bhd	-	Malaysia
Resintech Plastics (M) Sdn Bhd	-	Malaysia
Polyflow Pipes Sdn Bhd	-	Malaysia
Polyflow Teguh Sdn Bhd	-	Malaysia
Cew Sin Plastic Pipe Sdn Bhd	-	Malaysia

### 4.3 Earthing Accessories

#### 4.3.1 Earthing Rod – 16 mm x 1830 mm (5/8” x 6’)

Manufacturer	Type/Catalogue/ Model No.	Country of Manufacture
Juan Kuang Electrical Accessories Manufacturer Sdn Bhd	-	Malaysia
<sup>(1)</sup> TAIPOLY Industries Sdn Bhd	-	Malaysia
<sup>(1)</sup> <b>Note:</b> Both ends of the rod shall be threaded with one end tapered.		
ERICO	-	USA
Furse	-	USA
Jinhua City Lightning Protection Equipment Manufacturer	-	China
LYTECH	-	Singapore
Lever E&E	STB	Malaysia
Raychem RPG Private Limited	RET-07	India

### 4.4 Fuses

#### 4.4.1 Single Pole House Service Cutout with/without HRC Fuse

Manufacturer	Type/Catalogue/ Model No.	Country of Manufacture
<b>Lucy Switchgear</b>	2286AL & ME60A HRC Fuse (60A) 2286AK & ME100A HRC Fuse (100A)	U.K.
WT Henley Ltd/SICAME	Series 7 Type IIa (60A) Series 7 Type IIb (100A)	U.K.
Lucy Switchgear	MK4 60A & 100A	China
Cooper Busmann	6080SP & 100SP	China
WT Henley Ltd/ SICAME (or SM-CI)	Series 7 Type IIa (60A) Series 7 Type IIb (100A)	China

#### 4.4.2 Fuse link/Cartridge fuse for Service Cut Out

Manufacturer	Type/Catalogue/ Model No.	Country of Manufacture
Lucy Switchgear	2286AL, ME60A & ME100A	U.K.
WT Henley Ltd	Series 7 Type II	U.K.
Lawson	ME/MF 60/100A	U.K.
Cooper Bussmann	KR85 & LR85	India
Conway Terminals Manufacturer Sdn Bhd	FK-FRH (up to 60A)	Malaysia

4.4.3 100A Neutral Link (5-Way Connector Box)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Lucy Switchgear	List MLNS	India/China
WT Henley Ltd/SICAME	Type II - 54347	U.K.
Cooper Busmann	Neutral-HS	China
WT Henley Ltd/ SICAME (or SM-CI)	Type II - 54347	China

4.4.4 250A Outdoor Dividing Box/MCCB Cabinet

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Lucy Switchgear	List 14018A/ 11515	U.K.
Powertech Engineering	-	Malaysia
Tenaga Kenari Sdn Bhd	-	Malaysia
LBF	-	Malaysia

4.4.5 400A Outdoor Dividing Box/MCCB Cabinet

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Lucy Switchgear	List No.14022/ 9212	U.K.
Powertech Engineering	-	Malaysia
Tenaga Kenari Sdn Bhd	-	Malaysia
LBF	-	Malaysia

4.4.6 LV HRC Fuse Link, Type JP, 40A to 400A

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Cooper Bussmann	MJ30-8 MJ30-7	U.K.
Conway Terminals Manufacturer Sdn Bhd	FNJ & FMJ	Malaysia
Lawson Fuse Ltd	-	U.K.

4.4.7 LV DIN Fuse Link, 63A, 100A and 200A

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Cooper Bussmann	NH 000 / NH 00 NH 2	U.K./India
JEAN MULLER	NH 00 NH 2	Germany Slovenia France
SIBA	NH 00 NH 2	Germany

#### 4.4.8 Type K Fuse Link, 11 kV, 5A to 100A

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Cooper Bussmann	15KBR	U.K./India
ABB	Type K	Australia
Cable & Power Supplies	FL8K	South Africa
Hawker Siddeley	Type K	U.K.
S & C Electric Company	Type K Positrol	U.S.A.

#### 4.4.9 Type K Fuse Link, 33 kV, 1A to 100A

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Cooper Bussmann	46KBR	U.K./India
ABB	Type K	Australia
Brush & Switchgear	Type K	U.K.
Cable & Power Supplies	FL16K	South Africa
Hawker Siddeley	Type K	U.K.
S & C Electric Company	Type K Positrol	U.S.A.

#### 4.4.10 11 kV Din Fuse Link (Air Type) 16A to 160A

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
SIBA	Air Type	Germany
Electricas SA (Mesa)	Fusarc CF 12	Spain
Cooper Bussmann	12TDLSJ	U.K./India
Cooper Xian	12TDLSJ	China
ABB	CEF	Poland

## 4.5 **Insulating oil**

### 4.5.1 Transformer Oil

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Nynas	NYTRO Gemini X	Sweden
<sup>(1)</sup> SHELL	Shell Diala S4 ZX-I	Malaysia
<sup>(1)</sup> <b>Note:</b> Base oil in Qatar, branded in Hong Kong		
<sup>(2)</sup> Hyrax Oil Sdn Bhd	HYPERTRANS HR	Malaysia
<sup>(2)</sup> <b>Note:</b> Sample test maybe required for purchase made by SESCO or delivery under turnkey project.		
Ergon	Hyvolt II and Hyvolt III	U.S.A

## 4.6 Earth Fault Indicator

### 4.6.1 Earth Fault Indicator for Underground Cables

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Elektro-Mechanik GmbH	EASI-R/EASI-A	Germany
Schneider	Flair 279	France
Nortroll AS	CableTroll 23XX	Norway
Horstmann GmbH	Earth Zero	Germany

### 4.6.2 Earth Fault Indicator for Overhead Line

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Schneider	Flite 110 SA	France
Nortroll AS	LineTroll LT110Eur	Norway
Elektro-Mechanik GmbH	FLA3	Germany

## 4.7 Battery Charger

### 4.7.1 Battery Charger

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
Sunpower Technologies	-	Malaysia
AEG	-	Singapore
Nimac	-	Malaysia
Berkat Insaf	-	Malaysia
PMI Elektrik	-	Turkey

## 4.8 Safety Glove

### 4.8.1 Safety Gloves Size 0 (1kV)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
W.H. Salisbury & Co	5-14B CL 0 T1 14" BLK	U.S.A
VOLTGARD / NORTH	E-014B	U.S.A
G.B. Industries Sdn Bhd	Novax	Malaysia
Ansell Industrial & Specialty Gloves Malaysia Sdn Bhd	-	Malaysia
Regeltex	-	France

4.8.2 Safety Gloves Size 2 (20kV)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
W.H. Salisbury & Co	-	U.S.A
VOLTGARD / NORTH	-	U.S.A
G.B. Industries Sdn Bhd	Novax	Malaysia
Ansell Industrial & Specialty Gloves Malaysia Sdn Bhd	-	Malaysia
Regeltex	-	France

4.8.3 Safety Gloves Size 4 (36.5kV)

<b>Manufacturer</b>	<b>Type/Catalogue/ Model No.</b>	<b>Country of Manufacture</b>
W.H. Salisbury & Co	40-16B CL 4 T1 16" BLK	U.S.A
VOLTGARD / NORTH	E-416B	U.S.A
G.B. Industries Sdn Bhd	Novax	Malaysia
Ansell Industrial & Specialty Gloves Malaysia Sdn Bhd	-	Malaysia
Regeltex	-	France

## 5.0 PROTECTION RELAYS

### 5.1 Current Differential Protection Relay

Function	Manufacturer /Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Current Differential Protection	SIEMENS / Berlin, Germany	7SD522	7SD5221-4PB99-9HK5+ M1A+ N2A+ LOR	4.72	132kV and above	<ul style="list-style-type: none"> <li>Inclusion of internal UV &amp; OV protection function</li> </ul>
	ABB / Sweden	RED670	1MRK002810-AG, RED670 F00, Ver 2.2	2.2 (2.2.2)	132kV and above	<ul style="list-style-type: none"> <li>Mandatory Accessories &amp; Software:-</li> <li>(a) PCM 600 2.8 Software</li> <li>(b) LAN Cable</li> </ul>
	GE /ALSTOM / Stafford, UK	P545	P545816A6M0760M	76	132kV and above	<ul style="list-style-type: none"> <li>Mandatory Accessories &amp; Software:-</li> <li>(a) MiCOM S1 Agile Software</li> <li>(b) Communication Converter (P591601A0M0200B)</li> </ul>
	Schneider Electric / Wuxi , Jiang Su, China	P545	P54531EA3M0H48M	H4	132kV and above	<ul style="list-style-type: none"> <li>Mandatory Accessories &amp; Software:-</li> <li>(a) Easergy Studio</li> <li>(b) Communication Converter ( P-2M-L3A11A011A)</li> </ul>
	SIEMENS / Berlin, Germany	7SD 610	7SD6101-◇BB09-0BA0+M2◇	4.74	33kV and below	<ul style="list-style-type: none"> <li>P-Set 4.73</li> </ul>
	Schneider Electric / Wuxi , Jiang Su, China	P521	P521-B0◇Z112DE0-SEB	DE (Software Version)	33kV and below	



## 5.2 Distance Protection Relay

Function	Manufacturer /Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Distance Protection	SIEMENS / Berlin, Germany	7SA 612	7SA6121-4NB99+5GB4+ M1A+LOR	4.74	132kV and above	<ul style="list-style-type: none"> <li>Inclusion of internal UV &amp; OV protection function</li> </ul>
	Schneider Electric / Wuxi , Jiang Su, China	P443	P44331EF3M0H48M	H4	132kV and above	<ul style="list-style-type: none"> <li>Mandatory Accessories &amp; Software:-               <ul style="list-style-type: none"> <li>(a) Easergy Studio</li> <li>(b) Communication Converter ( P-2M-L-3A11A011A)</li> </ul> </li> </ul>

### 5.3 Transformer Bias Differential Protection Relay

Function	Manufacturer /Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Transformer Bias Differential protection	GE /ALSTOM / Stafford, UK	P643	P64392BF6M0060M	6	275kV and below	
	SIEMENS (REYROLLE) / Berlin, Germany or Goa, India	7SR24	7SR2422-2BA11-0BA0	R8b-7c	275kV and below	
	SIEMENS / Berlin, Germany	7UT613	7UT6131-4EB91-1AA0+LOR	4.65	132kV and above	<ul style="list-style-type: none"> <li>For Transmission substation installation</li> </ul>
	Schneider Electric / Wuxi , Jiang Su, China	P632	P632849010F0311412653-921	653-700	132kV and above	<ul style="list-style-type: none"> <li>2 Windings</li> <li>Mandatory Accessories &amp; Software:</li> <li>(a) Easergy Studio</li> </ul>
	Schneider Electric / Wuxi , Jiang Su, China	P633	P633849910H0311418653-921	653-700	132kV and above	<ul style="list-style-type: none"> <li>3 Windings</li> <li>Mandatory Accessories &amp; Software:</li> <li>(a) Easergy Studio</li> </ul>
	ABB / Sweden	RET670	1MRK 004 816-AC	1.2	132kV and above	<ul style="list-style-type: none"> <li>For Capacitor bank</li> <li>Mandatory Accessories &amp; Software:</li> <li>(a) PCM 600 2.8 Software</li> </ul>
	SIEMENS/ Berlin, Germany	7UT613	7UT6131-◊EB02-1AA0	4.65	33kV and below	<ul style="list-style-type: none"> <li>For Distribution substation installation</li> </ul>
	Schneider Electric / Wuxi , Jiang Su, China	P631	P631-449-000-◊-0-311-412-652-921-SEB	311-412-652 (Software Version)	33kV and below	
	ABB/ Finland	RET 615	RET615 HBT DBABA NBA1 ANN ◊1G	5.0 FP1 (5.1.6)	33kV and below	

#### 5.4 Restricted Earth Fault Protection Relay

Function	Manufacturer /Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Restricted Earth Fault Protection	SIEMENS (REYROLLE) / Berlin, Germany or Goa, India	7SR1101	7SR1101-1DA12-2CA0	R4g-3c	275kV and below	
	SIEMENS (REYROLLE) / Berlin, Germany or Goa, India	7PG23-5B3	7PG2311-1DA30-1BA0	NA	275kV and below	
	Schneider Electric / Wuxi, Jiang Su, China	P721	P721000Z112CB0	12.B	275kV and below	<ul style="list-style-type: none"> <li>Mandatory Accessories &amp; Software:                             <ul style="list-style-type: none"> <li>(a) Easergy Studio</li> </ul> </li> </ul>
	ABB/ Finland	REB611	REB611HBA ABA 1NN ◇1G	2.0 (2.0.1)	33kV and below	

### 5.5 Busbar Protection Relay

Function	Manufacturer /Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Busbar Protection	SIEMENS (REYROLLE) / Berlin, Germany or Goa, India	7SR23	7SR2303-1BA77-0CA0	R8b-1b	132kV and Above	
	Schneider Electric / Wuxi , Jiang Su, China	P723	723000Z112CB0	12.B	275kV and below	<ul style="list-style-type: none"> <li>Mandatory Accessories &amp; Software:</li> <li>(a) Easergy Studio</li> </ul>
	SIEMENS (REYROLLE) / Berlin, Germany or Goa, India	7SR23	7SR2300-1BA12-0CA0	R8b-1b	33kV and below	

## 5.6 Overcurrent and Earth Fault Protection Relay

Function	Manufacturer /Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Overcurrent and Earth Fault Protection	Schneider Electric / Wuxi , Jiang Su, China	P123	P123-B00- Z112-EB-0-SEB	<i>EB (Software Version)</i>	275kV and below	
	SIEMENS (REYROLLE) / Berlin, Germany or Goa, India	7SR1103	7SR1103-10A12-2CA0	R4g-3c	275kV and below	
	SEL / USA	751A	751A50100X0X800200	R419	275kV and below	
	ABB / Finland	REF611	REF611 HBB ABA 1NA01G	2.0 (2.0.1)	275kV and below	
	GE /ALSTOM / Stafford, UK	P14N	P14NB11A3B0530A	53	275kV and below	
	SIEMENS/ Berlin, Germany	7SJ612	7SJ6121-4EB91-1FA0+L0R	4.93	132kV and above	<ul style="list-style-type: none"> <li>For Transmission substation installation</li> </ul>
	SIEMENS/ Berlin, Germany	7SJ612	7SJ6121-0EB02-1FA0	4.93	33kV and below	<ul style="list-style-type: none"> <li>For Distribution substation installation</li> </ul>

## 5.7 Directional Overcurrent and Earth Fault Protection Relay

Function	Manufacturer /Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Directional Overcurrent and Earth Fault Protection	SIEMENS/ Berlin, Germany	7SJ622	7SJ6221-4EB91-1FC0+L0R	4.93	132kV and Above	• For Transmission substation installation
	SIEMENS / Berlin, Germany	7SJ622	7SJ6221-∅EB02-1FC0	4.93	33kV and below	• For Distribution substation installation
	SIEMENS (REYROLLE) / Berlin, Germany or Goa, India	7SR1206	7SR1206-2∅A12-2CA0	R4g-3c	275kV and below	
	Schneider Electric / Wuxi , Jiang Su, China	P127	P127-BA0- Z112-FE-0-SEB	<i>FE (Software Version)</i>	275kV and below	
	ABB / Finland	REF 615	REF615 HBF FAEAG NBA1 ANA∅ 1G	<i>5.0 FPI (5.1.6)</i>	275kV and below	
	GE /ALSTOM / Stafford, UK	P14D	P14DB11A3C0530A	53	275kV and below	

## 5.8 Transformer Standby Earth Fault Protection Relay

Function	Manufacturer /Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Transformer Standby Earth Fault protection	SIEMENS/ Berlin, Germany	7SJ600	7SJ6001-4EA00-0DA0	V3.21	132kV and Above	
	SIEMENS (REYROLLE) / Berlin, Germany or Goa, India)	7SR1101	7SR1101-1◇A12-2CA0	R4g-3c	275kV and below	
	Schneider Electric / Wuxi , Jiang Su, China	P122	P122-B00- Z112-EB-0-SEB	<i>EB (Software Version)</i>	33kV and below	
	GE /ALSTOM / Stafford, UK	P14N	P14NB11A3B0530A	53	275kV and below	

### 5.9 Sensitive Earth Fault Protection Relay

Function	Manufacturer /Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Sensitive Earth Fault Protection	SIEMENS / Berlin , Germany	7SJ612	7SJ6122-0EB92-1FB0	4.93	33kV and below	
	SIEMENS (REYROLLE) / Berlin, Germany or Goa, India)	7SR1101	7SR1101-30A12-2CA0	R4g-3c	33kV and below	



### 5.10 Circuit Breaker Fail Protection Relay

Function	Manufacturer/ Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Circuit Breaker Failure Protection	SIEMENS / Berlin , Germany	7VK611	7VK6111-4AB91-4YC0+L0R	4.71	132kV and above	
	ABB / Sweden	REQ650	REQ650*1.3-A11X00-X00-B1X0-D-0-S0-E-SA3-AAXX-F	1.3.5.1 (Firmware) 1.3.0.4 (Product Version)	132kV and above	
	SEL /USA	751A	751A50100X0X80200	R419	275kV and below	
	Schneider Electric / Wuxi , Jiang Su, China	P821	P821B00Z112AE0	10.E	275kV and below	
	SIEMENS / Berlin , Germany or Goa, India	7SR1103	7SR1103-10A12-2CA0	R4g-3c	33kV and below	
	SIEMENS / Berlin , Germany	7SV600	7SV6001-0EA00-0DA0	3.02	33kV and below	

### 5.11 Over/Under Frequency Protection Relay

Function	Manufacturer/ Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Over / Under Frequency	SEL /USA	751A	751A50100X7380200	R419	275kV and below	
	SIEMENS / Berlin , Germany or Goa, India	7RW	7RW8020-5EB96-1DA0+L0R	4.62	132kV and Above	• For transmission substation installation
		7RW	7RW8020-5EB00-1DA0	4.62	33kV and below	• For Distribution substation installation

### 5.12 Over/Under Voltage Protection Relay

Function	Manufacturer/ Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Over /Under Voltage	SIEMENS / Berlin, Germany or Goa , India	7RW	7RW8020-5EB96-1DA0+L0R	4.62	132kV and Above	
	SEL /USA	751A	751A50100X7380200	R419	275kV and below	
	SIEMENS (REYROLLE) / Goa , India	7SR158	7SR1587 – 5HA12-2DA0/BB	2436H80011R4e-2a	275kV and below	• Mandatory Accessories & Software: (a) Reydisp Evolution (b) Type B USB
	SIEMENS (REYROLLE) / Goa , India	7SR191	7SR1916-1HA12-2CAO	R2e-1a	275kV and below	• For Capacitor bank protection application • Mandatory Accessories & Software: (a) Reydisp Evolution (b) Type B USB

### 5.13 Shunt Reactor High Impedance Circulating Protection Relay

Function	Manufacturer/ Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Shunt Reactor High Impedance Circulating Protection	SIEMENS (REYROLLE) / Berlin, Germany or Goa , India	7SR23	7SR2302-1BA77-0CA0	R8b-1b	275kV and below	

### 5.14 Autoreclose + Synchro-Check Relay

Function	Manufacturer/ Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Autoreclose + Synchro-check	SIEMENS/ Berlin, Germany	7VK	7VK6111-4AB91- 4YN0+LOR	4.71	132kV and above	
	Schneider Electric / Wuxi , Jiang Su, China	P841	P841311A3M0G78M	G7	132kV and above	<ul style="list-style-type: none"> <li>Mandatory Accessories &amp; Software: (a) Easergy Studio</li> </ul>
	Schneider Electric / Wuxi , Jiang Su, China	P123	P123-B00- Z112-EB-0-SEB	<i>EB (Software Version)</i>	33kV and below	
	SEL /USA	751A	751A50100X0X800200	R419	33kV and below	
	SIEMENS / Berlin, Germany or Goa, India)	7SR1103	7SR1103-10A12-2DA0	R4g-3c	33kV and below	

### 5.15 Synchro-Check Relay

Function	Manufacturer/ Country	Relay Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Synchronising	SIEMENS/ Berlin, Germany	7VK	7VK6101-4AB91- 4YN0+LOR	4.71	132kV and above	<ul style="list-style-type: none"> <li>For transmission substation installation</li> </ul>
	Schneider Electric / Wuxi , Jiang Su, China	P841	P841311A3M0G78M	G7	132kV and above	<ul style="list-style-type: none"> <li>Mandatory Accessories &amp; Software: (a) Easergy Studio</li> </ul>
	SIEMENS (REYROLLE) / Goa , India	7SR157	7SR1578-5HA12-2CAO/BB	2436H80010R4e- 2a	275kV and below	<ul style="list-style-type: none"> <li>Mandatory Accessories &amp; Software: (a) Reydisp Evolution (b) Type B USB</li> </ul>
	SIEMENS / Berlin, Germany or Goa , India	7VK	7VK6101-∅AB02-4YN0	4.71	33kV and below	<ul style="list-style-type: none"> <li>For Distribution substation installation</li> </ul>
	SIEMENS / Berlin, Germany or Goa , India	7RW	7RW8020-5EB96- 1DC0+LOR	4.62	132kV and above	<ul style="list-style-type: none"> <li>For transmission substation installation</li> </ul>
	SIEMENS / Berlin, Germany or Goa , India	7RW	7RW8020-5EB00-1DC0	4.62	33kV and below	<ul style="list-style-type: none"> <li>For Distribution substation installation</li> </ul>
	SEL /USA	751A	751A5∅1∅0X0X8∅0200	R419	33kV and below	

### 5.16 Capacitor Bank Protection Relay

Function	Manufacturer/ Country	Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
<ul style="list-style-type: none"> <li>• Capacitor unbalance/ thermal overload protection</li> <li>• Reactor thermal overload protection</li> <li>• Resistor thermal overload/open circuit protection</li> </ul>	SIEMENS (REYROLLE) / Goa , India	7SR191	7SR1916-1HA12-2CAO	R2e-1a	275kV and below	<ul style="list-style-type: none"> <li>• Mandatory Accessories &amp; Software:</li> <li>(a) Reydisp Evolution</li> <li>(b) Type B USB</li> </ul>
	TRENCH /Austria	CPR 04	CPR4-00-110.	4v81 (Software Version: 5v1)	132kV and Above	<ul style="list-style-type: none"> <li>• Mandatory Accessories &amp; Software:</li> <li>(a) Manual</li> <li>(b) CD with software</li> <li>• PC-software Version 5v10</li> <li>(c) Communication Cable</li> <li>(d) Relay Calibration Certificate</li> </ul>

## 6.0 Disturbance Recorder

Function	Manufacturer/ Country	Model	Ordering Code	Firmware Version	Voltage Limit	Remarks
Disturbance Recorder	QUALITROL / Northern Ireland	BEN 6000	BEN 6000	2.5.25	275kV and below	
	SIEMENS/ Berlin , Germany	7KE85	7KE85-JAAA-AA0- 0AAAA0-AA8111-13113A- AAA000-000AC1-CB1BA1- CB1CB1-CB1CB1- BC1CG0-◇◇◇	7.50	275kV and below	(c) Mandatory Accessories & Software:- (a) DIGSI 5 software premium) (b) SICAM PQ Analyzer (PQA) software (c) SICAM PQS/ PAS (Data Concentrator) (d) GPS (e) Ethernet Switch

## 7.0 Ancillary Equipment

### 7.1 Trip Circuit Supervision Relay

Function	Manufacturer/ Country	Model	Ordering Code	Voltage Limit	Remarks
Trip Circuit Supervision	GE /ALSTOM / Stafford, UK	MVAX31	MVAX31S1DE0754A	275kV and below	
	SIEMENS / Berlin, Germany or Goa, India	7PA3032	7PA3032-1AA00-1	275kV and below	(d) Single phase
	RMS / Australia	ALPHA	XR5-∅ -1/4/6∅ (ALPHA XR Series)	275kV and below	
	Schneider Electric / Wuxi , Jiang Su, China	REL913	REL91323	275kV and below	
	ABB / Sweden	SPER IBI	-	33kV and below	



## 7.2 Lockout Relay

Function	Manufacturer/ Country	Model	Ordering Code	Voltage Limit	Remarks	
Lockout	GE /ALSTOM / Stafford, UK	MVAJ105	MVAJ105RA0802B	275kV and below	(e) Voltage rating : 110/125V	
	SIEMENS / Berlin, Germany or Goa, India	7PA2231	7PA2001-1	275kV and below		
	RMS/ Australia	ALPHA/ DELTA/ 6RJ	TR 5/12 - 00 - 1/2/3/4 0	(ALPHA TR Series)	275kV and below	
			AR 5/12 - 00 - 1/2/3/4 0	(ALPHA AR Series- 1 element)		
			AR25 - 00 - 1/2/3/4 0	(ALPHA AR Series- 1 element)		
			TRD-400	(DELTA TRD Series)		
			6RJ25-20-00	(6RJ Series)		
	Schneider Electric / Wuxi , Jiang Su, China	REL912	REL91263	(4 changeover contacts)	275kV and below	
REL91283			(8 changeover contacts)			

### 7.3 Tripping Relay

Function	Manufacturer/ Country	Model	Ordering Code	Voltage Limit	Remarks
Tripping	ABB / India	ABB RXMS	RXMS1 RK216 x63-AN	275kV and below	
	SIEMENS/ Berlin, Germany or Goa, India	7PA2732	7PA2◇◇2-0AA00-◇	275kV and below	
	SIEMENS/ Berlin, Germany or Goa, India	TR221	7PG1522-1HA40-1AF0	275kV and below	(f) For Busbar Protection tripping
		AR ◇11	7PG11◇1-1EA10-0C◇0		(g) For Busbar Zone indicating
	RMS/ Australia	ALPHA/ DELTA	TR 5/12 - ◇◇ - 1/2/3/4 ◇ (ALPHA TR Series)	275kV and below	
			AR 5/12 - ◇◇ - 1/2/3/4 ◇ (ALPHA AR Series- 1 element)		
			AR 25 - ◇◇ - 1/2/3/4 ◇ (ALPHA AR Series-2 element)		
			TRD-4◇◇ -(DELTA TRD Series)		
	Schneider Electric / Wuxi , Jiang Su, China	REL912	REL91203 (4 changeover contacts)	275kV and below	
			REL91223 (Fast trip relay with 4 changeover contacts)		

#### 7.4 Test Terminal Block

Function	Manufacturer/ Country	Model	Ordering Code	Voltage Limit	Remarks
Testing Facilities	ABB / India	RTXP 18/24	a) Test Socket: a. RTXP 18 RK926-115-◇◇ b. RTXH 24 RK926 315-◇◇ b) Test Plug: a. RTXH 18 RK926 011- BC b. RTXH 24 RK926 016- AA	275kV and below	
	SIEMENS (REYROLLE) / Berlin, Germany or Goa ,India	2RMLG07	c) Test Socket : 7XG2220-3AA00- 0AA0 d) Test Plug : 7XG2240-3AA00- 0AA0	275kV and below	
	RMS/ Australia	4M Series	<ul style="list-style-type: none"> <li>• Test Socket : 4M400-◇◇</li> <li>• Test Plug : 4M42◇-◇</li> </ul>	132kV and above	
	SIEMENS (REYROLLE) / Berlin, Germany or Goa ,India	2RMLG01	<ul style="list-style-type: none"> <li>• Test Socket : 7XG2220-1AA00-            0AA0</li> <li>• Test Plug : 7XG2240-1AA00-0AA0</li> </ul>	33kV and below	

### 7.5 DC Supervision Relay

Function	Manufacturer/ Country	Model	Ordering Code	Voltage Limit	Remarks
DC Supervision	SIEMENS (REYROLLE) / Berlin, Germany or Goa ,India	XR152	7PG1741-3BD10-4AA0	275kV and below	
	Schneider Electric / Wuxi , Jiang Su, China	REL913	REL91344	275kV and below	

Note:

1. The recommended relay ordering no. indicated by  $\diamond$  are to be specified based on actual installation requirement / SESCO application.
2. The protection relay manufacturer/supplier shall provide 10 years product warranty from the date of supply. Faulty relays shall be collected from and replacement shall be delivered to SEB office without cost to SEB.
3. The Disturbance recorder manufacturer/supplier shall provide 5 years product warranty from the date of supply. Faulty disturbance recorders shall be collected from and replacement shall be delivered to SEB office without cost to SEB.
4. The ancillary equipment manufacturer/supplier shall provide 5 years product warranty from the date of supply. Faulty disturbance recorders shall be collected from and replacement shall be delivered to SEB office without cost to SEB