Reg No 2003/011612/30

RE-ADVERT (2)

CD49/2023

THE MANUFACTURE, SUPPLY, DELIVERY OF NEW 12 kV and 22kV INDOOR METAL CLAD SWITCHGEAR, 12kV/ 22kV FIXED PATTERN NON-EXTENDABLE (RMU) SWITCH-GEAR AND ASSOCIATED EQUIPMENT. THE SUPPLY OF SPARES,REPAIR OF EXISTING SWITCHGEAR AND THE RETROFIT OF THE EXISTING SWITCHGEAR AND ASSOCI-ATED EQUIPMENT.

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1. STATEMENT OF INVITATION

CENTLEC (SOC) Ltd (Here after referred to as CENTLEC) a Municipal Entity distributing electricity in Mangaung and other Municipalities invites suitable bidders to bid for the manufacture, supply, delivery of new 12kV and 22 kV indoor metal clad switchgear, 12kV/22kV fixed pattern non-extendable (RMU) switchgear and associated equipment. The supply of spares, repair of existing switchgear and the retrofit of existing switchgear as per specifications detailed below for a period of thirty-six (36) months.

2. MINIMUM REQUIREMENTS

2.1. Supply unique security personal identification number (PIN) from SARS for TAX compliant status.

2.2. Supply municipal services (water, sanitation, rates and electricity) clearance certificate or Lease Agreement with a current Bill and rates clearances, or Current Bill of Account not owing more than 90 days. In a case where the services are paid by the Landlord, the signed lease agreement and statement of account must be submitted by the bidder.

2.1.1 In an event, that the Bidder utilizes prepaid services (e.g. Water or electricity) a valid municipal clearance certificate(s) must still be provided.

2.2 CIDB grading – Level 6 EP and above.

2.3 The service provider must supply valid letter of good standing with the Compensation Commissioner.

2.4 The bidder must be registered with National Treasury Data Base of suppliers and proof thereof must be submitted.

2.5 Proof of ISO 9001 quality accreditation from the manufacturer of the goods (a certified copy of the accreditation will suffice).

2.6 Please note that the Special Conditions table as per point 3 below, needs to be met. All supporting documents need to be submitted where applicable.

3. DEFINITIONS AND ABBREVIATIONS

3.1 A - Ampere
3.2 V - Voltage
3.3 kVA - Kilo Volt Ampere
3.4 LV - Low Voltage
3.5 Hz - Hertz
3.6 ISO - International Organization for Standardization
3.7 IEC - International Electro Technical Commission Standards
3.8 SANS - South Africa Nasional Standard
3.9 Ue – Operational voltage
3.10 Ui - Isolation voltage
3.11 VA - Volt Ampere
3.12 kA - Kilo Ampere
3.13 Ct - Current transformer
3.14 Pt - Potential transformer
3.15 NER - Neutral Earth Resistor
3.16 NERCT – Neutral Earth Compensator Resistor

4. SCOPE OF WORK

4.1 The bidder will be required to manufacture, supply and deliver the following:

4.1.1 Part A: 12 kV and 22kV vacuum indoor metal clad switchgear.
4.1.2 Part B: 12 kV and 22kV fixed pattern metal clad ring main unit and associated accessories according to the applicable standards.
4.1.3 Part C: Vacuum circuit breakers to replace AG16 oil type circuit breakers and the repairs of 12kV switchgear on Adhoc quotation basis. Retrofit existing circuit breakers (Reyrolle).

4.2 The bidder will be required to repair on existing 12kV switchgear:
4.2.1 Repair existing 12kV circuit breakers and related equipment in CENTLEC's network.
4.2.2 Strip and quote quotations on repairs of existing 12kV switchgear, related equipment and the transporting from Bloemfontein to their premises and back to CENTLEC.
4.2.3 The supply of spares on existing equipment and associated equipment .

4.3 Supply the related Protective Relays and other listed items in the Pricing Schedule.

5. TECHNICAL SPECIFICATION

5.1 METEOROLOGICAL CONDITIONS AT CENTLEC SUPPLY AREA

1. Outdoor temperatures in degrees Celsius	Annual mean – 24.4; Maximum = 40; Minimum = -10
2. Average relative humidity	At 8h00 = 76%; at 14h00 = 33%; at 20h00 = 48% Minimum = 7% and Maximum = 98%
3. Thunderstorm activity	Severe Thunderstorms

Table 1 – Climatological Data

5.2 ELECTRICAL SYSTEM IN BLOEMFONTEIN

5.2.1 Voltage: 11 000 /400 Volt
5.2.2 Phase: 3 (A-Red, B-Yellow and C-Blue)
5.2.3 Frequency: 50 Hz
5.2.4 On the 11 kV side at the transformers 33/11 kV and 132kV/11kV in distribution centers in Bloemfontein; the neutral is earthed through a resistor to limit the maximum current to 300 A, 20Ω or 600 A, 10Ω. Please note that the circuit breakers must still be designed to a fault level capacity of 350 MVA.

5.2.5 Phase rotation is non-standard. (Red, Yellow, Blue) Must be labeled on switch-gear.

5.2.6 The load on the system consists mainly of lighting, heating and inductive loads.

5.2.7 The three types of cable mainly used on the 11 kV network are 240 mm² Cu paper insulated lead, 185mm² Al paper insulated lead and 70 mm² Cu paper insulated lead, cable.

5.2.8 The insulation level for the voltage transformers must be according to SANS 780: 2009.

5.3 SPECIFICATIONS ON SWITCHGEAR:

5.3.1 Busbar insulation: -

Busbars, cable termination points and all live metal shall be fully and suitably insulated. Busbars which use air only as insulating medium is not acceptable. Switchgear and bus-bar insulation shall be designed to prevent the risk of accidental short circuit due to animals and vermin. Busbar connections must be tinted (Silver plate).
The degree of Ingress-Protection for the metal-clad switchgear shall conform to IP4X.

5.3.2 Rated insulation level: -

Switchgear must have a basic impulse insulation withstand level of 95 kV.

5.3.3 Voltage transformers: -

5.3.3.1 Voltage transformer shall comply with the requirements of SANS (SANS) IEC 60044-2, 3 phase, 100VA, Class 0.5 and shall be the encapsulated type that is fully encapsulated in epoxy resin and must be fitted with an earthed metal screen. Only the LIMB /swivel type with interlocking busbar shutters will be considered on switchgear type A2, A3,A10, 22A2, 22A3, and 22A10. The phasing must be labelled clearly.

5.3.3.2 Take note of the primary connection position of all 11000/110 Volt voltage transformers on the switchgear. The position of voltage transformer shall be Cable side mounted as specified in the schedule unless specifically specified otherwise on an order.

5.3.3.3 The 110-volt DC (secondary side) fuses must be accessible and easy to replace without isolation of the voltage transformer or the removing of covers.

5.3.3.4 Installation of a panel mounted voltmeter is only necessary if the protection relay is unable to display the primary voltage.

5.3.4 Metering: -

5.3.4.1 Circuit breaker panels, schedule A2, A3,A10, 22A2, 22A3, and 22A10, metering CT's must be installed as specification unless otherwise specified on order, according to schedules for the above mentioned panels.

5.3.4.2 Connection points (HV side) on the metering current transformers must be such that it can be easily insulated (taped).

5.3.5 Protection and auxiliary equipment: -

All Protection Relays offered in the main offer must be consistent with the technical specifications as listed and described in the schedules under item 6.4 below including the dimensions. All Current transformers will be studded type where all small wiring will be terminated labelled and numbered.

5.3.6 Protection Relay and Bus Wiring must be as follows: -

The auxiliary DC supply (protection relay auxiliary supply) and the tripping/closing DC supply must be separated and individually supplied (Moulded Case Circuit Breakers). Both DC supply circuits must be wired to the rear terminal box.

5.3.7 Install arc flash protection in cable termination chamber and busbar chamber to trip each individual circuit breaker. Light sensors must be installed at the specific points that have the greatest risk of arc flash. Light sensors must be linked to the protective relay. The protective relay must be easily integrated with the supervisory and control system, enabling remote settings and configuration, and must have a high-speed pickup. Light sensors must be interconnected to the protective relay by fiber optic cables to eliminate the need for other components inside the cubicles.

5.3.8 Hand-held remote control (Pendant control), for closing and tripping the circuit breaker, must be standard on all panels. This can be accomplished by a plug-in type of extension lead with trip / close control (minimum 15m in length).

5.3.9 Auxiliary wiring between the switchgear panel and the withdrawable circuit breaker shall be by means of a wire harness with a detachable socket. Interlocking to prevent operation of the switchgear is required if the detachable socket is not firmly in position.

5.3.10 Provision must be made for the circuit breaker status (“open” or “closed”) to be indicated on the panel, using a LED type lamp indicator.

5.3.11 All spare circuit breaker auxiliary contacts (“a” and “b”) must be wired to rear terminal box.

5.3.12 Auto-reclose status and sensitive earth fault status must be flagged on the protection relay display.

5.3.13 Auto-reclose on sensitive earth fault must be selectable via a front panel selector switch. This must be duplicated on the protective relay.

5.3.14 Auto-reclose, “On” and “Off” must be selectable via a front panel selector switch. This may be duplicated on the relay. Need both to be installed.

5.3.15 Ammeters are only to be installed if the protection relays are incapable of displaying instantaneous current values. In this case, only a single meter must be installed on the yellow phase, with the appropriate interposing CT.

5.3.16 Cable termination boxes: -

5.3.16.1 Surge Arresters must be installed on all type A7 an 22A7 panels and be situated in the power cable termination box as close as possible to the terminal connecting point to the cable. Surge arresters installed must not have an integral disconnecting device.

5.3.16.2 All power cable termination boxes must cater for split gland plates and include a PVC wedge type, non-ferrous, cable retaining cleat to accommodate 70mm^2 Cu PILC cable, 185 mm^2 Al PILC cable 240mm^2 and 300mm^2 Cu or aluminium PILC cable.

5.3.17 Labels (All labels shall conform to SANS 1885: 2001 clause 4.17).

5.4 PART A: - METAL-CLAD SWITCHGEAR 12kV and 22kV.

NOTE:

On all the equipment, offered by the bidders, they must indicate the manufacturers name (brand name), type and make. They must also indicate the warranties and guarantees offered on these equipment: Warranty refers to product repairs. Guarantee means replacement of products or parts.
Please note that CENTLEC utilized a template for the switchgear and where **N/A** appeared the bidder must just indicate **N/A** as well. The rest must be completed.
This information must be tendered on for the duration of contract. Drawings will be signed of only ones for approval of design. The switchgear will be of latest design with the circuit breaker enclosure door, with an earthing interlocking mechanism to ensure operator safety.
The new switchgear that are tendered for must have a spare list in the pricing schedules that must be available for the duration of this contract.
The 12kV circuit breakers, 32VDC, will be painted **grey (G-29).** The 12kV circuit breakers 110VDC, will be painted as per specification under dimension.
Where Arc flash protection is applicable, the sensors must be installed and wired to the relays from the cable compartment, busbar chamber and from the circuit breaker compartments.

NEW METAL-CLAD SWITCHGEAR 12kV (SBV4-E, SBV3-E types or equivalent), PARTICILARS OFFERED AND GURANTEED, AS SCHEDULED A1 to A11 AND 22 A1 TO 22A10.

5.4.1 **A1 SWITCH-DISCONNECTOR**

SCHEDULE A1: SWITCH-DISCONNECTOR PANEL – COMPATIBLE WITH ALL SWITCHGEAR PANELS		**PART A – METAL-CLAD SWITCHGEAR**		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A1	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL MANUFACTURER, MAKE, TYPE				
Panel Function		Switch Disconnectors		
Insulation Medium		oil and vacuum	4.3.1.1.3	
System Voltage	kV	11	4.1.1.1	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Manual	4.3.1.9	
Trip Coil	V	Hand Operated	4.3.1.10	

SCHEDULE A1: SWITCH-DISCONNECTOR PANEL – COM-PATIBLE WITH ALL SWITCHGEAR PANELS		**PART A – METAL-CLAD SWITCHGEAR**		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A1	**UNITS**	**SPECIFIED RE-QUIREMENT FOR THIS SWITCH-GEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OF-FERED**
Spring Release Coil	V	N/A	4.3.1.10	
Indication for Trip/Close		YES	4.3.1.2	
Status Indication Lamps (open/close)	LED	N/A	4.3.2.2 a)	
Circuit Earthing Facilities		Bottom Entry	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PLIC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Ca-ble.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	
Remote Control Unit		N/A (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		

SCHEDULE A1: SWITCH-DISCONNECTOR PANEL – COM-PATIBLE WITH ALL SWITCHGEAR PANELS		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A1	**UNITS**	**SPECIFIED RE-QUIREMENT FOR THIS SWITCH-GEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OF-FERED**
Width	mm	Max 600		
CURRENT TRANSFORMERS:				
Install CT's		N/A	4.8	
Purpose		N/A		
Ratio		N/A		
Burden		N/A		
Class		N/A		
Quantity		N/A		
Insulation Level		N/A		
Install Ct's (Metering/Differential)		N/A	4.8	
Purpose		N/A		
Burden		N/A		
Ratio		N/A		
Class		N/A		
Quantity		N/A		
Insulation Level		N/A		
Voltage Transformer: Manufacturer, Make, Type				
Install VT		No	4.9	
Ratio		N/A		

SCHEDULE A1: SWITCH-DISCONNECTOR PANEL – COM-PATIBLE WITH ALL SWITCHGEAR PANELS		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A1	**UNITS**	**SPECIFIED RE-QUIREMENT FOR THIS SWITCH-GEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OF-FERED**
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
AMMETER (provide details)				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER: (provide details)				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		Centlec drawing TS-9-7		
Spare auxiliary Contacts required		N/A	4.14	
		N/A		
Marking/Labeling/Documentation		N/A	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		N/A	4.10	
High Speed Pilot wire protection-“Solkor RF” or compatible		N/A	4.10	

SCHEDULE A1: SWITCH-DISCONNECTOR PANEL – COMPATIBLE WITH ALL SWITCHGEAR PANELS		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A1	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	
3 Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay Hand reset Flag (SEL 751A)		N/A	4.10	
D.C Circuit Protection		N/A	4.14.3	
Location of Fuses inside RC		N/A		
Location of Test Terminal Blocks RC Door		N/A	4.14.7	
Battery Charger with Batteries – 32 Volt		No		
Number of copies of Drawings supplied with Panel on delivery		Yes	7.3	
Number of copies of Routine Test Report Certificates on delivery		Yes	7.4	

Table 2: A1 Switchgear.

5.4.2 A2 CIRCUIT BREAKER

SCHEDULE A2: CIRCUIT BREAKER - MV CONNECTION < 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A2	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCH-GEAR.**	**SANS CLAUS E**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OF-FERED**
SWITCHGEAR GENERAL; Manufacturer, Make, Type				
Panel Function		MV Connection < 1MVA		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	11	4.1.1.1	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Handspring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PLIC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	

SCHEDULE A2: CIRCUIT BREAKER - MV CONNECTION < 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A2	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCH-GEAR.**	**SANS CLAUS E**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OF-FERED**
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S con-nections.**		
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		100/1		
Burden		10VA		
Class		10P10		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10VA		
Ratio		60/30/5		
Class		0.5		
Quantity		2		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		Yes	4.9	
Ratio		11000/110 V		
Burden and Accuracy		0.5		
Voltage Factor		1.9		
Limbs		3		
Primary Connection		Cable side		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		

SCHEDULE A2: CIRCUIT BREAKER - MV CONNECTION < 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A2	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCH-GEAR.**	**SANS CLAUS E**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OF-FERED**
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		Yes	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS -9- 7		
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities: i. **Power Supply:** Universal – 24 to 120V DC/AC. ii. **Secondary Input Cur-rent:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No **v. Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Proto-col**: DNP3_level 2 minimum vii. **Digital Optoisolated In-puts**: must have 10 inputs. Wetting voltage range should be 24 - 250 VDC (External wetting); Inputs should be individually user-configured to operate.	4.10	

SCHEDULE A2: CIRCUIT BREAKER - MV CONNECTION < 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A2	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCH-GEAR.**	**SANS CLAUS E**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OF-FERED**
		viii. **Digital Optoisolated high speed and high current Outputs**: Minimum of 6A continuous current carrying capabilities, Minimum of 5 outputs. Outputs must have a voltage range of 19.2 – 275 VDC. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sen-sors for ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, re-port retrieval, metering, HMI, and control; At no ad-ditional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the con-trol panel portion of the switchgear.		
High Speed Pilot wire protection-“Solkor RF” or equivalent		N/A	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay Hand reset Flag or LEDs		Yes	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber		
D.C Circuit Protection		MCB’s	4.14.3	
Location of MCB inside RC		Yes		

SCHEDULE A2: CIRCUIT BREAKER - MV CONNECTION < 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A2	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCH-GEAR.**	**SANS CLAUS E**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OF-FERED**
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on de-livery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 3: A2 Switchgear.

5.4.3 A3 CIRCUIT BREAKER

SCHEDULE A3: CIRCUIT BREAKER - MV CONNECTION > 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A3	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		MV Connection > 1MVA		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	11	4.1.1.1	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Hand Spring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	

SCHEDULE A3: CIRCUIT BREAKER - MV CONNECTION > 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A3	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PLIC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		600/1		
Burden		10VA		
Class		10P10		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10VA		
Ratio		300/200/100/5		
Class		0.5		

SCHEDULE A3: CIRCUIT BREAKER - MV CONNECTION > 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A3	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Quantity		2		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		Yes	4.9	
Ratio		11000/110 V		
Burden and Accuracy		0.5		
Voltage Factor		1.9		
Limbs		3		
Primary Connection		Cable side		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		Yes	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS-9-8		
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities: i. **Power Supply: Universal – 24 to 120V** DC/AC.	4.10	

SCHEDULE A3: CIRCUIT BREAKER - MV CONNECTION > 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A3	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		ii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No v. **Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Protocol**: DNP3_level 2 minimum vii. **Digital Optoisolated Inputs**: must have 10 inputs. Wetting voltage range should be 24 - 250 VDC (External wetting); Inputs should be individually user-configured to operate. viii. **Digital Optoisolated high speed and high current Outputs**: Minimum of 6A continuous current carrying capabilities, Minimum of 5 outputs. Outputs must have a voltage range of 19.2 – 275 VDC. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, report		

SCHEDULE A3: CIRCUIT BREAKER - MV CONNECTION > 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A3	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection-“Solkor RF” or com-patible		N/A	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay Hand reset Flag or LEDs		Yes	4.10	
Arc Flash sensors		Cable, Circuit Breaker and Busbar chamber		
D.C Circuit Protection		MCB’s	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 4: A3 Switchgear.

5.4.4 A4 CIRCUIT BREAKER SECONDARY FEEDER

SCHEDULE A4: CIRCUIT BREAKER - SECONDARY FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A4	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Secondary Feeder		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	11	4.1.1.1	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Handspring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PILC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	

SCHEDULE A4: CIRCUIT BREAKER - SECONDARY FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICU-LARS NOTE: PANEL MUST BE MARKED ON TOP A4	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		600/1		
Burden		10VA		
Class		10P10		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		No	4.8	
Purpose		N/A		
Burden		N/A		
Ratio		N/A		
Class		N/A		
Quantity		N/A		
Insulation Level		N/A		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		N0	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
Primary Connection		N/A		

SCHEDULE A4: CIRCUIT BREAKER - SECONDARY FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICU-LARS NOTE: PANEL MUST BE MARKED ON TOP A4	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS-9-8		
Spare auxiliary Contacts required		“a”-2	4.14	
		“b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities: i. **Power Supply:** Universal – 24 to 120V DC/AC. ii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No **v. Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Protocol**: DNP3_level 2 minimum	4.10	

SCHEDULE A4: CIRCUIT BREAKER - SECONDARY FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A4	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		vii. **Digital Optoisolated Inputs**: must have 10 inputs. Wetting voltage range should be 24 – 250 VDC (External wetting), Inputs should be individually user-configured to operate. viii. **Digital Optoisolated high speed and high current Outputs**: Minimum of 6A continuous current carrying capabilities, Minimum of 5 outputs. Outputs must have a voltage range of 19.2 – 275 VDC. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection- "Solkor RF" or compatible		N/A	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	

SCHEDULE A4: CIRCUIT BREAKER - SECONDARY FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A4	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay Hand reset Flag or LEDs		N/A	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB's	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 5: A4 Switchgear.

5.4.5 A5 CIRCUIT BREAKER PRIMARY OUT GOING FEEDER

SCHEDULE A5: CIRCUIT BREAKER – PRIMARY OUT-GOING FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICU-LARS NOTE: PANEL MUST BE MARKED ON TOP A5	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manu-facturer, Make, Type				
Panel Function		Primary Out-Going Feeder		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	11	4.1.1.1	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Handspring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)		Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PILC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				

SCHEDULE A5: CIRCUIT BREAKER – PRIMARY OUT-GOING FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICU-LARS NOTE: PANEL MUST BE MARKED ON TOP A5	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		600/1		
Burden		10VA		
Class		10P10		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Pilot wire protection		
Burden				
Ratio		600/1		
Class		X or TPS or PX		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manu-facturer, Make, Type				
Install VT		N0	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
Primary Connection		N/A		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		

SCHEDULE A5: CIRCUIT BREAKER – PRIMARY OUT-GOING FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A5	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
VOLTMETER:				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS -9- 8		
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities: i. **Power Supply:** Universal – 24 to 120V DC/AC. ii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No **v. Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Protocol**: DNP3_level 2 minimum vii. **Digital Optoisolated Inputs**: must have 10 inputs. Wetting voltage range should be 24 – 250 VDC (External wetting), Inputs should be	4.10	

SCHEDULE A5: CIRCUIT BREAKER – PRIMARY OUT-GOING FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A5	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		individually user-configured to operate. viii. **Digital Optoisolated high speed and high current Outputs**: Minimum of 6A continuous current carrying capabilities, Minimum of 5 outputs. Outputs must have a voltage range of 19.2 – 275 VDC. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection-" Solkor RF" or compatible		Yes	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay		N/A	4.10	

SCHEDULE A5: CIRCUIT BREAKER – PRIMARY OUT-GOING FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A5	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Hand reset Flag or LEDs				
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB's	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 6: A5 Switchgear.

5.4.6 A6 CIRCUIT BREAKER TRANSFORMER FEEDER.

SCHEDULE A6: CIRCUIT BREAKER TRANSFORMER FEEDER.		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A6	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Transformer Feeder		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	11	4.1.1.1	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	

SCHEDULE A6: CIRCUIT BREAKER TRANSFORMER FEEDER.		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A6	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Hand Spring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PLIC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		60/30/1		
Burden		10VA		
Class		10P10		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		N/A	4.8	

SCHEDULE A6: CIRCUIT BREAKER TRANSFORMER FEEDER.		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A6	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Purpose		N/A		
Burden		N/A		
Ratio		N/A		
Class		N/A		
Quantity		N/A		
Insulation Level		N/A		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		No	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS-9-9		
Spare auxiliary Contacts required		“a”-2	4.14	
		“b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities:	4.10	

SCHEDULE A6: CIRCUIT BREAKER TRANSFORMER FEEDER.		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A6	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		i. **Power Supply:** Universal – 24 to 120V DC/AC. ii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No **v. Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Protocol**: DNP3_level 2 minimum vii. **Digital Optoisolated Inputs**: must have 10 inputs. Wetting voltage range should be 24 - 250 VDC (External wetting), Inputs should be individually user-configured to operate. viii. **Digital Optoisolated high speed and high current Outputs**: Minimum of 6A continuous current carrying capabilities, Minimum of 5 outputs. Outputs must have a voltage range of 19.2 – 275 VDC. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		

SCHEDULE A6: CIRCUIT BREAKER TRANSFORMER FEEDER.		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A6	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
High Speed Pilot wire protection-"Solkor RF" or compatible		N/A	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay Hand reset Flag or LEDs		N/A	4.10	
D.C Circuit Protection		MCB's	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 7: A6 Switchgear.

5.4.7 A7 CIRCUIT BREAKER OVERHEAD LINE FEEDER

SCHEDULE A7: CIRCUIT BREAKER OVERHEAD LINE FEEDER		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A7	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Overhead line feeder		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	11	4.1.1.1	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Auto Spring Charge	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PILC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		Yes, Cable side 12kV	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	

SCHEDULE A7: CIRCUIT BREAKER OVERHEAD LINE FEEDER		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICU-LARS NOTE: PANEL MUST BE MARKED ON TOP A7	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		600/1		
Burden		10VA		
Class		10P10		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10 VA		
Ratio		300/200/100/5		
Class		0.5		
Quantity		2		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		Yes	4.9	
Ratio		11000/110		
Burden and Accuracy		0.5		
Voltage Factor		1.9		
Limbs		3		
Primary Connection		Cable side		
AMMETER:				
Scale		Yes	4.14.4	
Interposing CT		N/A		

SCHEDULE A7: CIRCUIT BREAKER OVERHEAD LINE FEEDER		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICU-LARS NOTE: PANEL MUST BE MARKED ON TOP A7	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		Yes	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS-9-9		
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities: i. **Power Supply:** 24VDC to 48VDC ii. **Secondary Input Current:** 3 phase 1 Amp AC current input/ 50mA Neutral AC current input. iii. **Voltage Input**: $V_{NOM\ (L\text{-}L)}$ should have the following specifications; 20 to 440V for DELTA_Y for DELTA and WYE iv. **Configurable labels**: Yes v. **Programmable pushbuttons**: Minimum of four programable pushbuttons, each with programable LEDs **vi. Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: 1 x Serial Port	4.10	

SCHEDULE A7: CIRCUIT BREAKER OVERHEAD LINE FEEDER		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A7	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		vii. **Communications Protocol**: DNP3 level 2 minimum. viii. **Digital Optoisolated Inputs**: Minimum of 8 inputs (External wetting), Inputs should be individually user-configured to operate. ix. **High Speed, High current Interruption (Outputs)**: Must be able to carry 6A continuous current. Minimum of 8 outputs. x. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. xi. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection- "Solkor RF" or compatible		N/A	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		Yes	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		Yes	4.10	

SCHEDULE A7: CIRCUIT BREAKER OVERHEAD LINE FEEDER		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A7	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Auto-reclose facility.		Yes: 30V DC electrical closing via ARC relay.	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB's	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 8: A7 Switchgear.

5.4.8 A8 CIRCUIT BREAKER PRIMARY INCOMER FEEDER

SCHEDULE A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Primary Incomer feeder		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	11	4.1.1.1	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	

SCHEDULE A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICU-LARS NOTE: PANEL MUST BE MARKED ON TOP A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Handspring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PILC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		No	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes Differential	4.8	
Purpose		Pilot wire protection		
Ratio		600/1		

SCHEDULE A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Burden		10VA		
Class		X or TPS or PX		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10VA		
Ratio		300/5		
Class		0.5		
Quantity		2		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		No	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
Primary Connection		N/A		
AMMETER:				
Scale		Yes	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		Yes	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS-9-10		

SCHEDULE A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Spare auxiliary Contacts required		"a"-2	4.14	
		:b"-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		No	4.10	
High Speed Pilot wire protection- "Solkor RF" or compatible		Yes	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		No	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		No	4.10	
Auto-reclose facility.		No	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB's	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	
PROTECTION:				

SCHEDULE A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
ARC FLASH MONITOR		Yes: The Relay must have these capabilities: Arc faults monitor 20 – 60 VDC i. Should have a tri-Colour LED, ii. Front push button reset, iii. Maximum of three arc sensor inputs iv. Two high speed tripping duty arc sense output contacts: 2 N/O, 1 N/C for the power supply. v. **Output contact ratings:** Continuous current carrying ability should be 5A AC or DC. vi. **Transient overvoltage:** Between all terminals and earth – 5kV 1.2/50 micro-seconds, 0,5 J. Between independent circuits without damage or flashover – 5kv 1.2/50 micro-seconds 0.5 J. vii. **Temperature range:** Operating: -5 to +55 degree Celsius. viii. **Case:** ZA12 flash or DIN rail mount type ix. Must have a continuous arc sensor supervision, x. Should have Integrated self-supervision, xi. Should have a fail alarm contact xii. **Operating voltage**: 20 - 60VDC xiii. Should provide three optical arc fault sensors that is applicable to the device. The sensor should have the following characteristics: Compact rugged design, three optical detectors, high speed arc	4.10	

SCHEDULE A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICU-LARS NOTE: PANEL MUST BE MARKED ON TOP A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		detection, Optional 20m and screened cable, heavy duty 6m terminal cables, sealed unit for harsh environments.		

Table 9: A8 Switchgear.

5.4.9 A9 CIRCUIT BREAKER BUS- SECTION SWITCH

SCHEDULE A9: CIRCUIT BREAKER BUS-SECTION SWITCH		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A9	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufac-turer, Make, Type				
Panel Function		Bus-Section Switch		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	11	4.1.1.1	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Hand Spring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	

SCHEDULE A9: CIRCUIT BREAKER BUS-SECTION SWITCH		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A9	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		N/A	4.3.1.9	
Main Cable Detail		Busbars to Link busbars through Circuit breaker.		
Main Cable Termination		N/A		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		No	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		No	4.8	
Purpose		N/A		
Ratio		N/A		
Burden		N/A		
Class		N/A		
Quantity		N/A		
Insulation Level		N/A		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10VA		
Ratio		300/200/100/5		
Class		0.5		

SCHEDULE A9: CIRCUIT BREAKER BUS-SECTION SWITCH		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A9	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Quantity		2		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manu-facturer, Make, Type				
Install VT		No	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
Primary Connection		N/A		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS -9- 10		
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities: i. **Power Supply:** Universal – 24 to 120V DC/AC.	4.10	

SCHEDULE A9: CIRCUIT BREAKER BUS-SECTION SWITCH		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A9	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		ii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No **v. Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Protocol**: DNP3_level 2 minimum vii. **Digital Optoisolated Inputs**: must have 10 inputs. Wetting voltage range should be 24 – 250 VDC (External wetting); Inputs should be individually user-configured to operate. viii. **Digital Optoisolated high speed and high current Outputs**: Minimum of 6A continuous current carrying capabilities, Minimum of 5 outputs. Outputs must have a voltage range of 19.2 – 275 VDC. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, report		

SCHEDULE A9: CIRCUIT BREAKER BUS-SECTION SWITCH		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A9	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection-"Solkor RF" or compatible		No	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		No	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		No	4.10	
Auto-reclose facility; 1A Phase and 50mA neutral.		No	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB's	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 10: A9 Switchgear.

5.4.10 A10 FUSED SWITCH DISCONNECTOR COMPATIBLE TO ALL PANELS

SCHEDULE A10: FUSED SWITCH DISCONNECTOR COMPATIBLE TO ALL PANELS		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS. NOTE: PANEL MUST BE MARKED ON TOP A10	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Fused-Switch Disconnector with metering.		
Insulation Medium		Oil and vacuum	4.3.2.1.6	
System Voltage	kV	11	4.1.1.1	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Handspring	4.3.1.9	
Trip Coil	V	No	4.3.1.10	
Spring Release Coil	V	No	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		PVC Wedge cleat 70 to 185 mm Cable		
Main Cable Termination		1x 185mm x 3 core PILC.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		No	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	

SCHEDULE A10: FUSED SWITCH DISCONNECTOR COMPATIBLE TO ALL PANELS		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS. NOTE: PANEL MUST BE MARKED ON TOP A10	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		No	4.8	
Purpose		N/A		
Ratio		N/A		
Burden		N/A		
Class		N/A		
Quantity		N/A		
Insulation Level		N/A		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10VA		
Ratio		60/30/5		
Class		0.5		
Quantity		2		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		Yes	4.9	
Ratio	V	11000/110 V		
Burden and Accuracy		0.5		
Voltage Factor		1.9		
Limbs		3		
Primary Connection		Cable side		
AMMETER:				
Scale		No	4.14.4	

SCHEDULE A10: FUSED SWITCH DISCON-NECTOR COMPATIBLE TO ALL PANELS		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS. NOTE: PANEL MUST BE MARKED ON TOP A10	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS -9- 10		
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		No	4.10	
High Speed Pilot wire protection-“Solkor RF” or compatible		No	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		No	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		No	4.10	
Auto-reclose facility; SEL 751AMOT: 751ABCBOX74810020		No	4.10	
Arc Flash Sensors		No	4.10	
D.C Circuit Protection		MCB’s	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	

SCHEDULE A10: FUSED SWITCH DISCONNECTOR COMPATIBLE TO ALL PANELS		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS. NOTE: PANEL MUST BE MARKED ON TOP A10	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 11: A10 Switchgear.

METAL-CLAD SWITCHGEAR 22kV (SBV4-E, types) or equivalent, Complete Colom, PARTICILARS OFFERED AND GURANTEED, from schedule 22A1 to 22A11. Please label the panels accordingly.

5.4.11 **22A1 SWITCH-DISCONNECTOR**

SCHEDULE 22A1: SWITCH-DISCONNECTOR PANEL – COMPATIBLE WITH ALL SWITCHGEAR PANELS		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A1	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Switch Disconnectors		
Insulation Medium		Vacuum and Oil	4.3.1.1.3	
System Voltage	kV	22	4.1.1.1	
Rated Voltage	kV	24	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	

SCHEDULE 22A1: SWITCH-DISCONNECTOR PANEL – COMPATIBLE WITH ALL SWITCHGEAR PANELS		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A1	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
Mechanism Type		Manual	4.3.1.9	
Trip Coil	V	Hand Operated	4.3.1.10	
Spring Release Coil	V	N/A	4.3.1.10	
Indication for Trip/Close		YES	4.3.1.2	
Status Indication Lamps (open/close)	LED	N/A	4.3.2.2 a)	
Circuit Earthing Facilities		Bottom Entry	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PLIC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	
Remote Control Unit		N/A (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:				
Install CT's		N/A	4.8	
Purpose		N/A		
Ratio		N/A		
Burden		N/A		
Class		N/A		
Quantity		N/A		

SCHEDULE 22A1: SWITCH-DISCONNECTOR PANEL – COMPATIBLE WITH ALL SWITCHGEAR PANELS		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A1	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
Insulation Level		N/A		
Install Ct's (Metering/Differential)		N/A	4.8	
Purpose		N/A		
Burden		N/A		
Ratio		N/A		
Class		N/A		
Quantity		N/A		
Insulation Level		N/A		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		No	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS-9-7		
Spare auxiliary Contacts required		N/A	4.14	
		N/A		
Marking/Labeling/Documentation		N/A	4.17	
Main Circuit Designation Label		Blank	4.17	

SCHEDULE 22A1: SWITCH-DISCONNECTOR PANEL – COMPATIBLE WITH ALL SWITCHGEAR PANELS		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP A1	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		N/A	4.10	
High Speed Pilot wire protection-"Solkor RF" or compatible		N/A	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay Hand reset Flag (SEL 751A)		N/A	4.10	
D.C Circuit Protection		N/A	4.14.3	
Location of Fuses inside RC		N/A		
Location of Test Terminal Blocks RC Door		N/A	4.14.7	
Battery Charger with Batteries – 30 Volt		No		
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 12: 22A1 Switchgear.

5.4.12 22A2 CIRCUIT BREAKER

SCHEDULE 22A2: CIRCUIT BREAKER - MV CONNECTION < 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22 A2	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		MV Connection < 1MVA		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	22	4.1.1.1	
Rated Voltage	kV	24	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Handspring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PLIC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				

SCHEDULE 22A2: CIRCUIT BREAKER - MV CONNECTION < 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22 A2	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		100/1		
Burden		10VA		
Class		10P10		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10VA		
Ratio		60/30/5		
Class		0.5		
Quantity		2		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		Yes	4.9	
Ratio		22000/110 V		
Burden and Accuracy		0.5		
Voltage Factor		1.9		
Limbs		3		
Primary Connection		Cable side		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		

SCHEDULE 22A2: CIRCUIT BREAKER - MV CONNECTION < 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22 A2	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
VOLTMETER:				
Voltmeter		Yes	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS -9- 7		
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities: i. **Power Supply:** Universal – 24 to 120V DC/AC. ii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No v. **Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Protocol**: DNP3_level 2 minimum vii. **Digital Optoisolated Inputs**: must have 10 inputs. Wetting voltage range should be 24 - 250 VDC (External wetting); Inputs	4.10	

SCHEDULE 22A2: CIRCUIT BREAKER - MV CONNECTION < 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22 A2	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		should be individually user-configured to operate. viii. **Digital Optoisolated high speed and high current Outputs**: Minimum of 6A continuous current carrying capabilities, Minimum of 5 outputs. Outputs must have a voltage range of 19.2 – 275 VDC. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection-“Solkor RF” or compatible		N/A	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay Hand reset Flag or LEDs		Yes	4.10	

SCHEDULE 22A2: CIRCUIT BREAKER - MV CONNECTION < 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22 A2	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber		
D.C Circuit Protection		MCB's	4.14.3	
Location of MCB inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 13: 22A2 Switchgear.

5.4.13 22A3 CIRCUIT BREAKER

SCHEDULE 22A3: CIRCUIT BREAKER - MV CONNECTION > 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A3	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		MV Connection > 1MVA		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	22	4.1.1.1	
Rated Voltage	kV	24	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	

SCHEDULE 22A3: CIRCUIT BREAKER - MV CONNECTION > 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A3	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Hand Spring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PLIC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		100/60/1		
Burden		10VA		
Class		10P10		
Quantity		3		

SCHEDULE 22A3: CIRCUIT BREAKER - MV CONNECTION > 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A3	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10VA		
Ratio		300/200/100/5		
Class		0.5		
Quantity		2		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		Yes	4.9	
Ratio		22000/110 V		
Burden and Accuracy		0.5		
Voltage Factor		1.9		
Limbs		3		
Primary Connection		Cable side		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		Yes	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS-9-8		
Spare auxiliary Contacts required		"a"-2	4.14	
		:b"-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	

SCHEDULE 22A3: CIRCUIT BREAKER - MV CONNECTION > 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A3	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities: i. **Power Supply:** Universal – 24 to 120V DC/AC. ii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No **v. Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Protocol**: DNP3_level 2 minimum vii. **Digital Optoisolated Inputs**: must have 10 inputs. Wetting voltage range should be 24 - 250 VDC (External wetting); Inputs should be individually user-configured to operate. viii. **Digital Optoisolated high speed and high current Outputs**: Minimum of 6A continuous	4.10	

SCHEDULE 22A3: CIRCUIT BREAKER - MV CONNECTION > 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A3	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		current carrying capabilities, Minimum of 5 outputs. Outputs must have a voltage range of 19.2 – 275 VDC. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection-“Solkor RF” or compatible		N/A	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay Hand reset Flag or LEDs		Yes	4.10	
Arc Flash sensors		Cable, Circuit Breaker and Busbar chamber		

SCHEDULE 22A3: CIRCUIT BREAKER - MV CONNECTION > 1MVA		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A3	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
D.C Circuit Protection		MCB's	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 14: 22A3 Switchgear.

5.4.14 22A4 CIRCUIT BREAKER SECONDARY FEEDER

SCHEDULE 22A4: CIRCUIT BREAKER - SECONDARY FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A4	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Secondary Feeder		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	22	4.1.1.1	
Rated Voltage	kV	24	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	

SCHEDULE 22A4: CIRCUIT BREAKER - SECONDARY FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A4	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Mechanism Type		Handspring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PILC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		100/60/1		
Burden		10VA		
Class		10P10		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		No	4.8	
Purpose		N/A		
Burden		N/A		

SCHEDULE 22A4: CIRCUIT BREAKER - SECONDARY FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A4	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Ratio		N/A		
Class		N/A		
Quantity		N/A		
Insulation Level		N/A		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		N0	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
Primary Connection		N/A		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS-9-8		
Spare auxiliary Contacts required		“a”-2	4.14	
		“b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities:	4.10	

SCHEDULE 22A4: CIRCUIT BREAKER - SECONDARY FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A4	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		i. **Power Supply:** Universal – 24 to 120V DC/AC. ii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No **v. Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Protocol**: DNP3_level 2 minimum vii. **Digital Optoisolated Inputs**: must have 10 inputs. Wetting voltage range should be 24 – 250 VDC (External wetting); Inputs should be individually user-configured to operate. viii. **Digital Optoisolated high speed and high current Outputs**: Minimum of 6A continuous current carrying capabilities, Minimum of 5 outputs. Outputs must have a voltage range of 19.2 – 275 VDC. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no		

SCHEDULE 22A4: CIRCUIT BREAKER - SECONDARY FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A4	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		additional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection-“Solkor RF” or compatible		N/A	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay Hand reset Flag or LEDs		N/A	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB’s	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 15: 22A4 Switchgear.

5.4.15 22A5 CIRCUIT BREAKER PRIMARY OUT GOING FEEDER

SCHEDULE 22A5: CIRCUIT BREAKER – PRIMARY OUT-GOING FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A5	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Primary Out-Going Feeder		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	22	4.1.1.1	
Rated Voltage	kV	24	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Handspring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)		Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PILC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		

SCHEDULE 22A5: CIRCUIT BREAKER – PRIMARY OUT-GOING FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICU-LARS NOTE: PANEL MUST BE MARKED ON TOP 22A5	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		100/60/1		
Burden		10VA		
Class		10P10		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Pilot wire protection		
Burden		15VA		
Ratio		600/1		
Class		X or TPS or PX		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manu-facturer, Make, Type				
Install VT		N0	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
Primary Connection		N/A		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS -9- 8		

SCHEDULE 22A5: CIRCUIT BREAKER – PRIMARY OUT-GOING FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A5	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Spare auxiliary Contacts required		"a"-2	4.14	
		:b"-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities: i. **Power Supply:** Universal – 24 to 120V DC/AC. ii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No v. **Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Protocol**: DNP3_level 2 minimum vii. **Digital Optoisolated Inputs**: must have 10 inputs. Wetting voltage range should be 24 – 250 VDC (External wetting); Inputs should be individually user-configured to operate. viii. **Digital Optoisolated high speed and high current Outputs**: Minimum of 6A continuous current carrying capabilities, Minimum of 5 outputs.	4.10	

SCHEDULE 22A5: CIRCUIT BREAKER – PRIMARY OUT-GOING FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A5	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		Outputs must have a voltage range of 19.2 – 275 VDC. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection-" Solkor RF" or compatible		Yes	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay Hand reset Flag or LEDs		N/A	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB's	4.14.3	
Location of Fuses inside RC		Yes		

SCHEDULE 22A5: CIRCUIT BREAKER – PRIMARY OUT-GOING FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A5	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 16: 22A5 Switchgear.

5.4.16 22A6 CIRCUIT BREAKER TRANSFORMER FEEDER.

SCHEDULE 22A6: CIRCUIT BREAKER TRANSFORMER FEEDER.		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A6	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Transformer Feeder		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	22	4.1.1.1	
Rated Voltage	kV	24	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Hand Spring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	

SCHEDULE 22A6: CIRCUIT BREAKER TRANS-FORMER FEEDER.		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A6	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND IN-DICATE THE PARTICLURES OFFERED**
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PLIC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		N/A	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connec-tions.**		
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		60/30/1		
Burden		10VA		
Class		10P10		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		N/A	4.8	
Purpose		N/A		
Burden		N/A		

SCHEDULE 22A6: CIRCUIT BREAKER TRANS-FORMER FEEDER.		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A6	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND IN-DICATE THE PARTICLURES OFFERED**
Ratio		N/A		
Class		N/A		
Quantity		N/A		
Insulation Level		N/A		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		No	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS-9-9		
Spare auxiliary Contacts required		“a”-2	4.14	
		“b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities:	4.10	

SCHEDULE 22A6: CIRCUIT BREAKER TRANS-FORMER FEEDER.		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A6	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND IN-DICATE THE PARTICLURES OFFERED**
		i. **Power Supply:** Universal – 24 to 120V DC/AC. ii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No **v. Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Protocol**: DNP3_level 2 minimum vii. **Digital Optoisolated Inputs**: must have 10 inputs. Wetting voltage range should be 24 – 250 VDC (External wetting); Inputs should be individually user-configured to operate. viii. **Digital Optoisolated high speed and high current Outputs**: Minimum of 6A continuous current carrying capabilities, Minimum of 5 outputs. Outputs must have a voltage range of 19.2 – 275 VDC. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for		

SCHEDULE 22A6: CIRCUIT BREAKER TRANS-FORMER FEEDER.		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A6	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection-“Solkor RF” or compatible		N/A	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		N/A	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		N/A	4.10	
Transformer Over Temperature tripping relay Hand reset Flag or LEDs		N/A	4.10	
D.C Circuit Protection		MCB’s	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 17: 22A6 Switchgear.

5.4.17 22A7 CIRCUIT BREAKER OVERHEAD LINE FEEDER

SCHEDULE 22A7: CIRCUIT BREAKER OVER-HEAD LINE FEEDER		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A7	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Overhead line feeder		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	22	4.1.1.1	
Rated Voltage	kV	24	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Auto Spring Charge	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PILC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		Yes, Cable side 12kV	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	

SCHEDULE 22A7: CIRCUIT BREAKER OVER-HEAD LINE FEEDER		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A7	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes	4.8	
Purpose		OC/EF Protection		
Ratio		100/60/1		
Burden		10VA		
Class		10P10		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10 VA		
Ratio		300/200/100/5		
Class		0.5		
Quantity		2		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		Yes	4.9	
Ratio		22000/110		
Burden and Accuracy		0.5		
Voltage Factor		1.9		
Limbs		3		
Primary Connection		Cable side		
AMMETER:				
Scale		Yes	4.14.4	
Interposing CT		N/A		

SCHEDULE 22A7: CIRCUIT BREAKER OVER-HEAD LINE FEEDER		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A7	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		Yes	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS-9-9		
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities: i. **Power Supply:** 24VDC to 48VDC ii. **Secondary Input Current:** 3 phase 1 Amp AC current input/ 50mA Neutral AC current input. iii. **Voltage Input**: $V_{NOM\ (L-L)}$ should have the following specifications: 20 to 440V for DELTA_Y for DELTA and WYE iv. **Configurable labels**: Yes v. **Programmable pushbuttons**: Minimum of four programable pushbuttons, each with programable LEDs **vi. Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: 1 x Serial Port	4.10	

SCHEDULE 22A7: CIRCUIT BREAKER OVER-HEAD LINE FEEDER		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A7	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		vii. **Communications Protocol**: DNP3 level 2 minimum. viii. **Digital Optoisolated Inputs**: Minimum of 8 inputs (External wetting), Inputs should be individually user-configured to operate. ix. **High Speed, High current Interruption (Outputs)**: Must be able to carry 6A continuous current. Minimum of 8 outputs. x. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. xi. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection-“Solkor RF” or compatible		N/A	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		Yes	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		Yes	4.10	
Auto-reclose facility.		Yes: 30V DC electrical closing via ARC relay.	4.10	

SCHEDULE 22A7: CIRCUIT BREAKER OVER-HEAD LINE FEEDER		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A7	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB's	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Cer-tificates on delivery		2	7.4	

Table 18: 22A7 Switchgear.

5.4.18 22A8 CIRCUIT BREAKER PRIMARY INCOMER FEEDER

SCHEDULE 22A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Primary Incomer feeder		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	22	4.1.1.1	
Rated Voltage	kV	24	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	

SCHEDULE 22A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Handspring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		70 to 185mm x 3core XLPE/PILC	4.3.1.2	
Main Cable Termination		PVC wedge cleat 70 to 185 mm Cable.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		No	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		Studded 6mm Brass S connections.		
Install CT’s		Yes Differential	4.8	

SCHEDULE 22A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
Purpose		Pilot wire protection		
Ratio		100/60/1		
Burden		10VA		
Class		X or TPS or PX		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10VA		
Ratio		300/5		
Class		0.5		
Quantity		2		
Insulation Level		IL 12/28/95 KV		
PROTECTION:				
ARC FLASH MONITOR		Yes: The Relay must have these capabilities: Arc faults monitor 20 – 60 VDC i. Should have a tri-Colour LED, ii. Front push button reset, iii. Maximum of three arc sensor inputs iv. Two high speed tripping duty arc sense output contacts: 2	4.10	

SCHEDULE 22A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		N/O, 1 N/C for the power supply. v. Output contact ratings: Continuous current carrying ability should be 5A AC or DC. vi. Transient overvoltage: Between all terminals and earth – 5kV 1.2/50 microseconds, 0,5 J. Between independent circuits without damage or flashover – 5kv 1.2/50 microseconds 0.5 J. vii. Temperature range: Operating: -5 to +55 degree Celsius. viii. Case: ZA12 flash or DIN rail mount type ix. Must have a continuous arc sensor supervision, x. Should have Integrated self-supervision, xi. Should have a fail alarm contact xii. Operating voltage: 20 - 60VDC xiii. Should provide three optical arc fault sensors that is applicable to the device. The		

SCHEDULE 22A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		sensor should have the following characteristics: Compact rugged design, three optical detectors, high speed arc detection, Optional 20m and screened cable, heavy duty 6m terminal cables, sealed unit for harsh environments.		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		No	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
Primary Connection		N/A		
AMMETER:				
Scale		Yes	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		Yes	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS-9-10		
Spare auxiliary Contacts required		“a”-2	4.14	

SCHEDULE 22A8: CIRCUIT BREAKER PRIMARY INCOMER FEEDER		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A8	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
		:b"-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		No	4.10	
High Speed Pilot wire protection-"Solkor RF" or compatible		Yes	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		No	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		No	4.10	
Auto-reclose facility.		No	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Bus-bar chamber	4.10	
D.C Circuit Protection		MCB's	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 19: 22A8 Switchgear.

5.4.19 22A9 CIRCUIT BREAKER BUS- SECTION SWITCH

SCHEDULE 22A9: CIRCUIT BREAKER BUS-SECTION SWITCH		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A9	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufac-turer, Make, Type				
Panel Function		Bus-Section Switch		
Insulation Medium		Vacuum	4.3.2.1.6	
System Voltage	kV	22	4.1.1.1	
Rated Voltage	kV	24	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Hand Spring	4.3.1.9	
Trip Coil	V	30 V D.C	4.3.1.10	
Spring Release Coil	V	30 V D.C	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		N/A	4.3.1.9	
Main Cable Detail		Busbars to Link busbars through Circuit breaker.		
Main Cable Termination		N/A		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		

SCHEDULE 22A9: CIRCUIT BREAKER BUS-SECTION SWITCH		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A9	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Surge Arrestors (suppressors)		No	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		No	4.8	
Purpose		N/A		
Ratio		N/A		
Burden		N/A		
Class		N/A		
Quantity		N/A		
Insulation Level		N/A		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10VA		
Ratio		300/200/100/5		
Class		0.5		
Quantity		2		
Insulation Level		IL 12/28/95 KV		
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		No	4.9	

SCHEDULE 22A9: CIRCUIT BREAKER BUS-SECTION SWITCH		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A9	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
Primary Connection		N/A		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS -9- 10		
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		Yes: The Relay must have these capabilities: i. **Power Supply:** Uni-versal – 24 to 120V DC/AC. ii. **Secondary Input Cur-rent:** 3 x AC 5A/1A plus a 1A/5A Neutral Input.	4.10	

SCHEDULE 22A9: CIRCUIT BREAKER BUS-SECTION SWITCH		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A9	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: No **v. Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: None vi. **Communications Protocol**: DNP3_level 2 minimum vii. **Digital Optoisolated Inputs**: must have 10 inputs. Wetting voltage range should be 24 – 250 VDC (External wetting); Inputs should be individually user-configured to operate. viii. **Digital Optoisolated high speed and high current Outputs**: Mini-mum of 6A continuous current carrying capa-bilities, Minimum of 5 outputs. Outputs must have a voltage range of 19.2 – 275 VDC.		

SCHEDULE 22A9: CIRCUIT BREAKER BUS-SECTION SWITCH		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A9	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. x. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xi. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.		
High Speed Pilot wire protection-“Solkor RF” or compatible		No	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		No	4.10	
3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		No	4.10	
Auto-reclose facility; 1A Phase and 50mA neutral.		No	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB’s	4.14.3	
Location of Fuses inside RC		Yes		

SCHEDULE 22A9: CIRCUIT BREAKER BUS-SECTION SWITCH		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED ON TOP 22A9	**UNITS**	**SPECIFIED REQUIRE-MENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Cer-tificates on delivery		2	7.4	

Table 20: 22A9 Switchgear.

5.4.20 22A10 FUSED SWITCH DISCONNECTOR COMPATIBLE TO ALL PANELS

SCHEDULE 22A10: FUSED SWITCH DISCON-NECTOR COMPATIBLE TO ALL PANELS		PART A – METAL-CLAD SWITCHGEAR (WITH METERING)		
DESCRIPTION OF PARTICULARS. NOTE: PANEL MUST BE MARKED ON TOP 22A10	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTICLURES OFFERED**
SWITCHGEAR GENERAL: Manufacturer, Make, Type				
Panel Function		Fused-Switch Disconnector with metering.		
Insulation Medium		Vacuum and Oil	4.3.2.1.6	
System Voltage	kV	22	4.1.1.1	
Rated Voltage	kV	24	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.3	
Busbar Normal Rated Current	Amp	800	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.4.2	
Short Circuit Breaking Capacity	kA	20	4.1.1.5	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type		Handspring	4.3.1.9	

Trip Coil	V	No	4.3.1.10	
Spring Release Coil	V	No	4.3.1.10	
Indication for Trip/Close		Yes	4.3.1.2	
Status Indication Lamps (open/close)	LED	Yes	4.3.2.2 a)	
Circuit Earthing Facilities		Yes	4.2.8.2	
System Earthing		NER 300 A Max	4.3.1.1.3	
Cable Entry		Bottom Entry	4.3.1.9	
Main Cable Detail		PVC Wedge cleat 70 to 185 mm Cable		
Main Cable Termination		1x 185mm x 3 core PILC.		
Circuit Earthing Facility		Yes	4.2.8.1	
Interlocks		Yes		
Surge Arrestors (suppressors)		No	4.2.7	
Remote Control Unit		Yes (open and close)	4.3.1.7	
DIMENSIONS (Must indicate dimensions to fit our substations)				
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		No	4.8	
Purpose		N/A		
Ratio		N/A		
Burden		N/A		
Class		N/A		
Quantity		N/A		
Insulation Level		N/A		
Install Ct's (Metering/Differential)		Yes	4.8	
Purpose		Metering		
Burden		10VA		
Ratio		60/30/5		
Class		0.5		
Quantity		2		
Insulation Level		IL 12/28/95 KV		

SCHEDULE 22A10: FUSED SWITCH DISCONNECTOR COMPATIBLE TO ALL PANELS		PART A – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS. NOTE: PANEL MUST BE MARKED ON TOP 22A10	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
VOLTAGE TRANSFORMER: Manufacturer, Make, Type				
Install VT		Yes	4.9	
Ratio	V	22000/110 V		
Burden and Accuracy		0.5		
Voltage Factor		1.9		
Limbs		3		
Primary Connection		Cable side		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		No	4.14.4	
Phase Selector Switch		N/A		
GENERAL:				
Configuration of Switchgear		TS -9- 10		
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)		No	4.10	
High Speed Pilot wire protection-“Solkor RF” or compatible		No	4.10	
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state		No	4.10	
3Pole Multi Shot Auto-Reclose Relay – min.		No	4.10	

4 Shot Programmable with counter-solid state				
Auto-reclose facility; SEL 751AMOT: 751ABCBOX74810020		No	4.10	
Arc Flash Sensors		No	4.10	
D.C Circuit Protection		MCB's	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 21: 22A10 Switchgear.

5.4.21 **(A) 12kV Secondary Feeder 110VDC panel: Existing switchgear.**

Tender must be for single and double busbars. (Upper bar / Lower Bar and Front / back bar) Complete with busbars. (SBV3 and SBV4 or compatible equivalent without juggle boxes) SBV3E and SBV3.

SCHEDULE 12: SBV 3E FEEDER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		**PART C – METAL-CLAD SWITCHGEAR**		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Panel Function		**Feeder**		
Insulation Medium		Vacuum		
System Voltage	kV	11	4.3.2.1.6	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	800	4.1.1.1	
Busbar Normal Rated Current	Amp	2500	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.3	
Short Circuit Breaking Capacity	kA	20	4.1.1.4.2	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type	M.W.S	Auto spring charges	4.1.1.5	
Trip Coil 120VDC	V	YES	4.3.1.9	

SCHEDULE 12: SBV 3E FEEDER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Spring Release Coil 110VDC	V	YES	4.3.1.10	
Indication for Trip/Close 110VDC		YES	4.3.1.10	
Status Indication Lamps (open/close) VCB open; Green LED indication. VCB Close: Red LED indication VCB Earthed: White LED indication. VCB In Service Position Amber indication.	LED	YES	4.3.1.2	
Local Remote selector switch		YES		
Circuit Earthing Facilities		Bottom Entry	4.3.2.2 a)	
System Earthing		NER 300 A,20Ω Max	4.2.8.2	
Cable Entry		Bottom Entry	4.3.1.1.3	
Main Cable Detail		70 to 240mm^2 x 3core XLPE/PILC 300 to 500mm^2 Single Core Cable	4.3.1.9	
Main Cable Termination		PVC wedge cleat 70 to 240 mm^2 Cable. PVC wedge cleat 300 to 500 mm^2		
Circuit Earthing Facility		Yes		
Interlocks		Yes	4.2.8.1	
Surge Arrestors (suppressors)		Yes		
Remote Control Unit. Panel fitted with cannon standoff trip/close socket.		Open and Close	4.2.7	
Panel heater (220V)		YES		
VCB Chamber light (110VDC)		YES		
DIMENSIONS			4.3.1.7	
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
Paint		**Cream**		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		

SCHEDULE 12: SBV 3E FEEDER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Install CT's		Yes		
Purpose		OC / EF	4.8	
Ratio		600/1		
Burden		10VA		
Class		5P20		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Differential)		YES		
Purpose		FEEDER	4.8	
Burden		kPV = 300V		
Ratio		600/1		
Class		X/TPS/PX		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install test block PK2-4way		YES (OC/EF)		
Install Ct's (Metering)		YES		
Purpose		Metering	4.8	
Burden		600/300/200/1		
Ratio		10VA		
Class		0.5		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install test block PK2-4way		YES (Diff / Metering)		
VOLTAGE TRANSFORMER				
Install VT		No	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		
Limbs		N/A		
Primary Connection		N/A		

SCHEDULE 12: SBV 3E FEEDER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		YES	4.14.4	
Phase Selector Switch		YES		
GENERAL:				
Configuration of Switchgear				
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes (Blank)	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state. Auto Re-Close: 3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		Yes: The Relay must have these capabilities: **i Power Supply:** Universal – 110 to 240 Vac/VDC. **ii Secondary Input Current:**3 x AC 1A plus a 50mA Neutral Input. **iii Voltage Input:** VNOM (L-L) should have the following specifications: 20 to 440V for DELTA_Y for DELTA and WYE **iv Configurable labels:** Yes **v Programmable pushbuttons:** Minimum of four programmable pushbuttons, each with programmable LEDs	4.10	

SCHEDULE 12: SBV 3E FEEDER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		vi Front panel LEDs: Status and Trip Target LEDs **vii Communication Ports:** Rear: 1 x 10/100 base-T plus 1 x 1 RS 232 port. Front: 1 x Serial Port **viii Communications Protocol:** Should have the following protocols: DNP3 level 2 minimum, standard plus IEC 61850, Modbus RTU, Modbus TCU, **ix Digital Optoisolated Inputs:** Minimum of 8. Universal – 110 Vac/VDC digital inputs with an operating range of 88 to 137,5 VDC (External wetting); Inputs should be individually user-configured to operate. **x High Speed, High current Interruption (Outputs):** Minimum of 6A continuous current – Minimum of 8 Universal – with a rated operating voltage of 264 VDC and a rated voltage range of 19.2 to 275 VDC. Should have a mechanical durability with a minimum of 100 000 no load operations." **xi Arc Flash capability:** 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay.		

SCHEDULE 12: SBV 3E FEEDER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		xii Software: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). **xiii Protection elements:** Relay should have the following elements: Phase, neutral, residual, and negative-sequence overcurrent elements; Phase, neutral, residual, and negative-sequence time-overcurrent elements; Current-based over- and under frequency; Arc-flash detection and arc-flash overcurrent; Over-and under voltage; Power elements; Voltage-based over- and under frequency; Rate-of-change of frequency; Measured residual overcurrent		
High Speed Pilot wire protection- “Solkor R or RF” or compatible. Differential protection.		Pilot wire Protection Relay, 1A or 5A and must be compatible with Solkor R/RF Relay.	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB’s 110VDC	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	

SCHEDULE 12: SBV 3E FEEDER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 22: Secondary Feeder 110VDC panel

5.4.22 **(B) Incomer 110VDC panel, existing switchgear:**
Tender must be for single and double busbars. (Upper bar / Lower bar and Front / back bar) Complete with busbars. SBV3E and SBV3 type.

SCHEDULE 12: SBV 3E INCOMER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Panel Function		Feeder		
Insulation Medium		Vacuum		
System Voltage	kV	11	4.3.2.1.6	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	1250	4.1.1.1	
Busbar Normal Rated Current	Amp	2500	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.3	
Short Circuit Breaking Capacity	kA	20	4.1.1.4.2	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type	M.W.S	Auto spring charges	4.1.1.5	
Trip Coil 120VDC	V	YES	4.3.1.9	
Spring Release Coil 110VDC	V	YES	4.3.1.10	
Indication for Trip/Close 110VDC		YES	4.3.1.10	
Status Indication Lamps (open/close) VCB open; Green LED indication. VCB Close: Red LED indication VCB Earthed: White LED indication.	LED	YES	4.3.1.2	

SCHEDULE 12: SBV 3E INCOMER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
VCB In Service Position Amber indication.				
Local Remote selector switch		YES		
Circuit Earthing Facilities		Bottom Entry	4.3.2.2 a)	
System Earthing		NER 300 A,20Ω Max	4.2.8.2	
Cable Entry		Bottom Entry	4.3.1.1.3	
Main Cable Detail	Provision for 9 x Cables, 3 x per phase	70 to 240mm^2 x 3core XLPE/PILC 300 to 500mm^2 Single Core Cable	4.3.1.9	
Main Cable Termination	Provision for 9 x Cables, 3 x per phase	PVC wedge cleat 70 to 240 mm^2 Cable. PVC wedge cleat 300 to 500 mm^2		
Circuit Earthing Facility		Yes		
Interlocks		Yes	4.2.8.1	
Surge Arrestors (suppressors)		Yes		
Remote Control Unit. Panel fitted with cannon standoff trip/close socket.		Open and Close	4.2.7	
Panel heater (220V)		YES		
VCB Chamber light (110VDC)		YES		
DIMENSIONS			4.3.1.7	
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
Paint		**Orange**		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes		
Purpose		OC / EF	4.8	
Ratio		600/1		
Burden		10VA		
Class		5P20		

SCHEDULE 12: SBV 3E INCOMER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Differential)		YES		
Purpose		FEEDER	4.8	
Burden		kPV = 300V		
Ratio		600/1		
Class		X/TPS/PX		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install test block PK2-4way		YES (OC/EF)		
Install Ct's (Metering)		YES		
Purpose		Metering	4.8	
Burden		600/300/200/1		
Ratio		10VA		
Class		0.5		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install test block PK2-4way		YES (Diff / Metering)		
VOLTAGE TRANSFORMER				
Install VT		Yes	4.9	
Ratio		11000/110/63.5 Volts		
Burden and Accuracy		100 VA Class 0.5		
Voltage Factor		1.9		
Limbs		3 or 5		
Primary Connection		Cable side		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		YES	4.14.4	

SCHEDULE 12: SBV 3E INCOMER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Phase Selector Switch		YES		
GENERAL:				
Configuration of Switchgear				
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes (Blank)	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state. Auto Re-Close: 3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		Yes: The Relay must have these capabilities: **i Power Supply:** Universal – 110 to 240 Vac/VDC. **ii Secondary Input Current:**3 x AC 1A plus a 50mA Neutral Input. **iii Voltage Input:** VNOM (L-L) should have the following specifications: 20 to 440V for DELTA_Y for DELTA and WYE **iv Configurable labels:** Yes **v Programmable pushbuttons:** Minimum of four programmable pushbuttons, each with programmable LEDs **vi Front panel LEDs :** Status and Trip Target LEDs **vii Communication Ports:** **Rear:** 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front:** 1 x Serial Port	4.10	

SCHEDULE 12: SBV 3E INCOMER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		viii Communications Protocol: Should have the following protocols: DNP3 level 2 minimum, standard plus IEC 61850, Modbus RTU, Modbus TCU, **ix Digital Optoisolated Inputs:** Minimum of 8. Universal – 110 Vac/VDC digital inputs with an operating range of 88 to 137,5 VDC (External wetting); Inputs should be individually user-configured to operate. **x High Speed, High current Interruption (Outputs):** Minimum of 6A continuous current – Minimum of 8 Universal – with a rated operating voltage of 264 VDC and a rated voltage range of 19.2 to 275 VDC. Should have a mechanical durability with a minimum of 100 000 no load operations." **xi Arc Flash capability:** 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay **xii Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay).		

SCHEDULE 12: SBV 3E INCOMER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		xiii Protection elements: Relay should have the following elements: Phase, neutral, residual, and negative-sequence overcurrent elements; Phase, neutral, residual, and negative-sequence time-overcurrent elements; Current-based over- and under frequency; Arc-flash detection and arc-flash overcurrent; Over-and under voltage; Power elements; Voltage-based over- and under frequency; Rate-of-change of frequency; Measured residual overcurrent.		
High Speed Pilot wire protection-“Solkor R or RF” or compatible. Differential protection.		NO	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB’s 110VDC	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 23: Incomer 110VDC panel

5.4.23 **(C) Bus Coupler 110VDC panel, existing switchgear:**
Tender must be for single and double busbars. (Upper / Lower bar and Front / back bar) Complete with busbars and boxes. SBV3E and SBV3.

SCHEDULE 12: SBV 3E BUS COUPLER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		**PART C – METAL-CLAD SWITCHGEAR**		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Panel Function		Feeder		
Insulation Medium		Vacuum		
System Voltage	kV	11	4.3.2.1.6	
Rated Voltage	kV	12	4.1.1.1	
Circuit Normal Rated Current	Amp	2000	4.1.1.1	
Busbar Normal Rated Current	Amp	2500	4.1.1.3	
Fault Level Capacity	MVA	350	4.1.1.3	
Impulse Withstand Voltage	kV	95	4.1.1.3	
Short Circuit Breaking Capacity	kA	20	4.1.1.4.2	
Duration of Short Circuit	s	3	4.1.1.5	
Peak Withstand Current	kA	63	4.1.1.5	
Mechanism Type	M.W.S	Auto spring charges	4.1.1.5	
Trip Coil 120VDC	V	YES	4.3.1.9	
Spring Release Coil 110VDC	V	YES	4.3.1.10	
Indication for Trip/Close 110VDC		YES	4.3.1.10	
Status Indication Lamps (open/close) VCB open; Green LED indication. VCB Close: Red LED indication VCB Earthed: White LED indication. VCB In Service Position Amber indication.	LED	YES	4.3.1.2	

SCHEDULE 12: SBV 3E BUS COUPLER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Local Remote selector switch		YES		
Circuit Earthing Facilities		Bottom Entry	4.3.2.2 a)	
System Earthing		NER 300 A,20Ω Max	4.2.8.2	
Cable Entry		Bottom Entry	4.3.1.1.3	
Main Cable Detail		70 to 240mm^2 x 3core XLPE/PILC 300 to 500mm^2 Single Core Cable	4.3.1.9	
Main Cable Termination		PVC wedge cleat 70 to 240 mm^2 Cable. PVC wedge cleat 300 to 500 mm^2		
Circuit Earthing Facility		Yes		
Interlocks		Yes	4.2.8.1	
Surge Arrestors (suppressors)		Yes		
Remote Control Unit. Panel fitted with cannon standoff trip/close socket.		Open and Close	4.2.7	
Panel heater (220V)		YES		
VCB Chamber light (110VDC)		YES		
DIMENSIONS			4.3.1.7	
Height	mm	Max 1800		
Depth	mm	Max 1500		
Width	mm	Max 600		
Paint		**Red**		
CURRENT TRANSFORMERS:		**Studded 6mm Brass S connections.**		
Install CT's		Yes		
Purpose		OC / EF	4.8	

SCHEDULE 12: SBV 3E BUS COUPLER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Ratio		600/1		
Burden		10VA		
Class		5P20		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install Ct's (Differential)		YES		
Purpose		FEEDER	4.8	
Burden		kPV = 300V		
Ratio		600/1		
Class		X/TPS/PX		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install test block PK2-4way		YES (OC/EF)		
Install Ct's (Metering)		YES		
Purpose		Metering	4.8	
Burden		600/300/200/1		
Ratio		10VA		
Class		0.5		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install test block PK2-4way		YES (Diff / Metering)		
VOLTAGE TRANSFORMER				
Install VT		No	4.9	
Ratio		N/A		
Burden and Accuracy		N/A		
Voltage Factor		N/A		

SCHEDULE 12: SBV 3E BUS COUPLER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Limbs		N/A		
Primary Connection		N/A		
AMMETER:				
Scale		No	4.14.4	
Interposing CT		N/A		
Maximum Demand Indicator		N/A		
VOLTMETER:				
Voltmeter		YES	4.14.4	
Phase Selector Switch		YES		
GENERAL:				
Configuration of Switchgear				
Spare auxiliary Contacts required		“a”-2	4.14	
		:b”-2		
Marking/Labeling/Documentation		Yes (Blank)	4.17	
Main Circuit Designation Label		Blank	4.17	
PROTECTION:				
Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state. Auto Re-Close: 3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state		Yes: The Relay must have these capabilities: **i Power Supply:** Universal – 110 to 240 Vac/VDC. **ii Secondary Input Current:**3 x AC 1A plus a 50mA Neutral Input. **iii Voltage Input:** VNOM (L-L) should have the following specifications: 20 to	4.10	

SCHEDULE 12: SBV 3E BUS COUPLER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		440V for DELTA_Y for DELTA and WYE **iv Configurable labels:** Yes **v Programmable pushbuttons**: Minimum of four programmable pushbuttons, each with programmable LEDs **vi Front panel LEDs:** Status and Trip Target LEDs **vii Communication Ports:** **Rear:** 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front:** 1 x Serial Port viii Communications Protocol: Should have the following protocols: DNP3 level 2 minimum, standard plus IEC 61850, Modbus RTU, Modbus TCU, **ix Digital Optoisolated Inputs:** Minimum of 8. Universal – 110 Vac/VDC digital inputs with an operating range of 88 to 137,5 VDC (External wetting); Inputs		

SCHEDULE 12: SBV 3E BUS COUPLER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		should be individually user-configured to operate. **x High Speed, High current Interruption (Outputs):** Minimum of 6A continuous current – Minimum of 8 Universal – with a rated operating voltage of 264 VDC and a rated voltage range of 19.2 to 275 VDC. Should have a mechanical durability with a minimum of 100 000 no load operations." **xi Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay **xii Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). **xiii Protection elements:** Relay should have the		

SCHEDULE 12: SBV 3E BUS COUPLER PANEL COMPATIBLE WITH ALL SWITCHGEAR PANELS (110VDC)		PART C – METAL-CLAD SWITCHGEAR		
DESCRIPTION OF PARTICULARS NOTE: PANEL MUST BE MARKED	**UNITS**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
		following elements: Phase, neutral, residual, and negative-sequence overcurrent elements; Phase, neutral, residual, and negative-sequence time-overcurrent elements; Current-based over- and under frequency; Arc-flash detection and arc-flash overcurrent; Over-and under voltage; Power elements; Voltage-based over- and under frequency; Rate-of-change of frequency; Measured residual overcurrent.		
High Speed Pilot wire protection-“Solkor R or RF” or compatible. Differential protection.		NO	4.10	
Arc Flash Sensors		Cable, Circuit Breaker and Busbar chamber	4.10	
D.C Circuit Protection		MCB’s 110VDC	4.14.3	
Location of Fuses inside RC		Yes		
Location of Test Terminal Blocks RC Door		Yes	4.14.7	
Number of copies of Drawings supplied with Panel on delivery		2	7.3	
Number of copies of Routine Test Report Certificates on delivery		2	7.4	

Table 24: Bus Coupler 110VDC panel

5.4.24 **Details of the Outdoor Circuit Breaker 12kV.**

5.4.24.1 Details for 800 Amp, 12kV VCB.

Vacuum Circuit Breakers must include the outdoor current transformers with the structures. Please specify each component separately and the total price per unit. **Note** that CENTLEC can order the breakers with 1Amp or 5Amp CT's.

DESCRIPTION OF PARTICULARS "OUTDOOR TYPE" 800Amp. 12B1 Labeling	SPECIFIED RE-QUIREMENT FOR THIS SWITCHGEAR.	SANS CLAUSE	MANUFACTURER, MAKE, TYPE AND INDI-CATE THE PARTI-CLURES OFFERED
SWITCHGEAR GENERAL: Brand Name, type and make			
Kiosk Function		Circuit breaker (Outdoor)	
Insulation Medium		Vacuum	
System Voltage	kV	11	
Rated Voltage	kV	12	
Circuit Normal Rated Current	Amp	800	
Busbar Normal Rated Current	Amp	800	
Fault Level Capacity	MVA	350	
Impulse Withstand Voltage	kV	95	
Short Circuit Breaking Capacity	kA	20	
Duration of Short Circuit	s	3	
Peak Withstand Current	kA	95	
Mechanism Type		Manual and remote	
Trip Coil	V	110 VDC	
Spring Release Coil	V	110 VDC	

DESCRIPTION OF PARTICULARS "OUTDOOR TYPE" 800Amp. 12B1 Labeling	SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.	SANS CLAUSE	MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED
Indication for Trip/Close		YES remote	
Status Indication Lamps (open/close)	YES	LED and Manual (see technical spec 5.3.11 below)	
Circuit Earthing Facilities		Bottom Entry	
System Earthing		NER 300 A Max 20Ω	
36kV Clamps		Yes (Palms with 4 x10mm holes)	
Completed stand		Legs, struts/straps, and bolts	
Circuit Earthing		Yes (Stand and kiosk earth studs)	
Interlocks		Yes	
Surge Arrestors (suppressors)		36kV	
Remote Control Unit		Yes (open and close)	
DIMENSIONS			
Height	mm	Max 2100	
Broad	mm	Max 1200	
Width	mm	Max 1200	
Structure galvanized steel	mm	Must be 1200 high with earthing M12 studs on two of the four legs	
Doors	IP4X	The doors must be moister prove and provision must be made for pad lock locking and protective covers over the locking device.	
CURRENT TRANSFORMERS:1A			
Install CT's	Yes		
Purpose		OC/EF	

DESCRIPTION OF PARTICULARS "OUTDOOR TYPE" 800Amp. 12B1 Labeling	SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.	SANS CLAUSE	MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED
Ratio		1200/800/400/1	
Burden		15VA	
Class		10P15	
Quantity		3	
Insulation Level		0.66kV	
Install Ct's (/Differential)	Yes		
Purpose		Differential	
Burden		15VA	
Ratio		1200/800/400/1	
Class		PX	
Knee Point		Min 180 Volts	
Quantity		3	
Insulation Level		0.66kV	
Install CT's Metering	Yes		
Purpose		Metering	
Ratio		1200/800/400/1	
Burden		15VA	
Class		0.2	
Quantity		2	
Insulation Level		0.66kV	
CURRENT TRANSFORMERS:5A			
Install CT's	Yes		

DESCRIPTION OF PARTICULARS "OUTDOOR TYPE" 800Amp. 12B1 Labeling	SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.	SANS CLAUSE	MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED
Purpose		OC/EF	
Ratio		1200/800/400/5	
Burden		15VA	
Class		10P15	
Quantity		3	
Insulation Level		0.66kV	
Install Ct's (/Differential)	Yes		
Purpose		Differential	
Burden		15VA	
Ratio		1200/800/400/5	
Class		PX	
Knee Point		Min 180 Volts	
Quantity		3	
Insulation Level		0.66kV	
Install CT's Metering	Yes		
Purpose		Metering	
Ratio		1200/800/400/5	
Burden		15VA	
Class		0.2	
Quantity		2	
Insulation Level		0.66kV	

Table 25: 800Amp 11kV Outdoor Breaker details

5.4.24.2 Details for 1250 Amp, 12kV, outdoor, Circuit breaker.

(Vacuum Circuit Breakers must include the outdoor current transformers with the structures. Please specify each component separately and the total price per unit. **Note** that CENTLEC can order the breakers with 1Amp or 5Amp CT's)

DESCRIPTION OF PARTICULARS "OUTDOOR TYPE" 800Amp. 12B2 Labeling	SPECIFIED REQUIRE-MENT FOR THIS SWITCH-GEAR.	SANS CLAUSE	MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED
SWITCHGEAR GENERAL: Brand Name, type and make			
Kiosk Function		Circuit breaker	
Insulation Medium		Vacuum	
System Voltage	kV	11	
Rated Voltage	kV	12	
Circuit Normal Rated Current	Amp	1250	
Busbar Normal Rated Current	Amp	2000	
Fault Level Capacity	MVA	350	
Impulse Withstand Voltage	kV	95	
Short Circuit Breaking Capacity	kA	20	
Duration of Short Circuit	s	3	
Peak Withstand Current	kA	95	
Mechanism Type		Manual and remote	
Trip Coil	V	110 VDC	
Spring Release Coil	V	110 VDC	
Indication for Trip/Close		YES remote	
Status Indication Lamps (open/close)	YES	LED and Manual (see technical spec 5.3.11 below)	

DESCRIPTION OF PARTICULARS "OUTDOOR TYPE" 800Amp. 12B2 Labeling	SPECIFIED REQUIRE-MENT FOR THIS SWITCH-GEAR.	SANS CLAUSE	MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED
Circuit Earthing Facilities		Bottom Entry	
System Earthing		NER 300 A Max 20Ω	
36kV Clamps		Yes (Palms with 4 x10mm holes)	
Completed stand		Legs, struts/straps, and bolts	
Circuit Earthing		Yes (Stand and kiosk earth studs)	
Interlocks		Yes	
Surge Arrestors (suppressors)		36kV	
Remote Control Unit		Yes (open and close)	
DIMENSIONS			
Height	mm	Max 2100	
Broad	mm	Max 1200	
Width	mm	Max 1200	
Structure galvanized steel	mm	Must be 1200 high with earthing M12 studs on two of the four legs	
Doors	IP4X	The doors must be moister prove and provision must be made for pad lock locking and protective covers over the locking device.	
CURRENT TRANSFORMERS:1A			
Install CT's	Yes		
Purpose		OC/EF	
Ratio		1200/800/400/1	
Burden		15VA	

DESCRIPTION OF PARTICULARS "OUTDOOR TYPE" 800Amp. 12B2 Labeling	SPECIFIED REQUIRE-MENT FOR THIS SWITCH-GEAR.	SANS CLAUSE	MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED
Class		10P15	
Quantity		3	
Insulation Level		0.66kV	
Install Ct's (/Differential)	Yes		
Purpose		Differential	
Burden		15VA	
Ratio		1200/1	
Class		PX	
Knee point		Min 180 Volts	
Quantity		3	
Insulation Level		0.66kV	
Install CT's Metering	Yes		
Purpose		Metering	
Ratio		1200/800/400/1	
Burden		15VA	
Class		0.2	
Quantity		2	
Insulation Level		0.66kV	
CURRENT TRANSFORMERS:5A			
Install CT's	Yes		
Purpose		OC/EF	
Ratio		1200/800/400/5	
Burden		15VA	

DESCRIPTION OF PARTICULARS "OUTDOOR TYPE" 800Amp. 12B2 Labeling	SPECIFIED REQUIRE-MENT FOR THIS SWITCH-GEAR.	SANS CLAUSE	MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED
Class		10P15	
Quantity		3	
Insulation Level		0.66kV	
Install Ct's (/Differential)	Yes		
Purpose		Differential	
Burden		15VA	
Ratio		1200/800/400/5	
Class		PX	
Knee point		Min 180 Volts	
Quantity		3	
Insulation Level		0.66kV	
Install CT's Metering	Yes		
Purpose		Metering	
Ratio		1200/800/400/5	
Burden		15VA	
Class		0.2	
Quantity		2	
Insulation Level		0.66kV	

Table 26: 1250 Amp, 12kV, outdoor, Circuit breaker

5.4.24.3 **The voltage transformer Details:** Can be order separately with extension bracket for structure, or already installed.

VOLTAGE TRANSFORMER			
DESCRIPTION OF PARTICULARS **"OUTDOOR TYPE" 800Amp.** **12B Labeling**	**SPECIFIED REQUIREMENT FOR THIS SWITCHGEAR.**	**SANS CLAUSE**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Install VT	Yes, only when ordered.	4.9	
Ratio		11000/110/63.5 Volts	
Burden and Accuracy		100 VA Class 0.5	
Voltage Factor		1.9	
Limbs		3 or 5	
Primary Connection		Cable or outgoing secondary side	

Table 27: The voltage transformer Details

5.4.25 **Rest of detail regarding the 12kV outdoor circuit breakers:**

5.4.25.1.1 Protection and auxiliary equipment: -

All Current transformers will be studded type and all small wiring will be terminated labeled and numbered. The small wiring must be wired to test blocks in the Circuit breaker kiosk. Gland plates for small cabling must be provided. The earth studs must be 6mm^2 brass with nuts and washers. Provide two main 13mm^2 brass earth studs that must connect to the main earth of the substations. (Opposite points on the steel enclosure).

5.4.25.2 Install a 220 Volt heater that must dry the air out in the switchgear compartments. Install a 220 Volt light (7W LED) inside the kiosk that must be energized when opening the kiosk door.

5.4.25.2.1 Auxiliary wiring between the circuit breaker and the kiosk shall be wrapped neatly by means of a wire harness.

5.4.25.3 Provision must be made for the circuit breaker status ("open" or "closed") to be indicated in the kiosk mechanically and with LED type lamp indicators (110VDC).

5.4.25.3.1 Labels (All labels shall conform to SANS 1885: 2001 clause 4.17).

5.4.25.4 All circuit breakers must be supplied with flag clamps, that fit the stork of the bushings and the ampere ratings of the circuit breaker. The flag palm must have four 13mm holes.

5.4.25.5 Must be able to mount the current transformers and potential transformers on the same structure of the circuit breaker.

5.4.25.6 All Outdoor Circuit Breakers and Potential Transformers must be painted admiral grey.

5.4.26 **Description of the 12kV and 22kV Joint (J)-, Switch (S)-, Test (T) - AND Panel (P)-packs according, to SANS 1885: 2001 and latest amendments, for 400A, 800A and 2000A specifications. This is applicable to new and existing equipment.**

Detail breakdown of "P, J, T and S-Packs"			
DESCRIPTION	**QTY**	**Part No.**	**COMMENTS**
"P-pack" (A12.1)			
38w scotch fill putty	18		1 set per panel. Packed in one box and labeled "P-pack".
Electrical scotch no 23 tapes	9		
18w no 33 tapes	18		
250 ml tin panel touch-up paint	1		
All bolts to bolt panels together (sink coated)	Box		
Busbar end covers (Painted red)	2		
100mm x 10 mm anchor bolts and nuts	6		
"J-pack" (A12.2 B)			
6x25mm inter panel earth bar	1		1 set per panel. Packed in one box labeled "J-pack".
800 Amp insulated, tinted busbars	3		
800 Amp lh/half joint shroud	3		
800 Amp rh/half joint shroud	3		
M12 washers for busbars	12		
M12 x 55 high tension busbar bolts (sink coated)	6		
M12 nuts	6		
M12 spring washers	6		
Insulated-lock cable ties	6		
"J-pack" (A12.2 B)			
6x25mm inter panel earth bar	1		1 set per panel. Packed in one box labeled "J-pack".
400 Amp insulated, tinted busbars	3		
400 Amp lh/half joint shroud	3		
400 Amp rh/half joint shroud	3		
M12 washers for busbars	12		
M12 x 55 high tension busbar bolts (sink coated)	6		
M12 nuts	6		
M12 spring washers	6		
Insulated-lock cable ties	6		
"J-pack" (A12.2 C)			
6x25mm inter panel earth bar	1		1 set per panel. Packed in one box labeled "J-pack".
2000 Amp insulated, tinted busbars	3		
2000 Amp lh/half joint shroud	3		
2000 Amp rh/half joint shroud	3		
M12 washers for busbars	12		
M12 x 55 high tension busbar bolts (sink coated)	6		
M12 nuts	6		
M12 spring washers	6		
Insulated-lock cable ties	6		
"S-pack" (A12.3)			
			1 set as per order. Packed in one box labeled "S-pack".
Circuit breaker ramp plate	1		
Circuit breaker spring charge handle	1		
Circuit breaker racking handle	1		
Hand-held remote control (pendant control 15m extension lead)	1		

Wall mounted Steel lockable cabinet for all items in "S-pack"	1		
"T-pack" (A12.4)			
Tests spouts Circuit breaker wear gauge Trollies (if applicable) Set of special tools (if applicable)	1 1 1 1		1 set as per order. Packed in one box labeled "T-pack".

Table 28: 12kV and 22kV Joint (J)-, Switch (S)-, Test (T) - AND Panel (P)-packs

5.5.1 **Part B: Fixed pattern 12kV and 22kV Metal Clad Ring Main Unit and associated accessories according to the applicable standards, non-extendable (Metering Unit).**

5.5.1.1 **Specification:-** (Please submit the configuration drawings with delivery and maintenance manuals).

B1. Ring main unit with fused transformer t-off feeder – without metering, fitted inside metal clad outdoor kiosk. SF6 gas and oil. Quote on both.

B2. Ring main unit with fused Medium Voltage connection feeder – with metering unit, fitted inside metal clad outdoor kiosk. The metering CT's must be fitted in the cable connection box, easily accessible when test or replaced. The CT's must be studded for secondary wiring and numbering. The Power transformer fuses on the secondary side must be easily accessible for testing.

B3. Ring main unit with two fused t-off feeders- One with metering for medium voltage connection feeder and the other one without metering for a transformer, fitted inside metal clad outdoor kiosk. The metering CT's must be fitted in the cable connection box of the medium voltage connection, easily accessible when test or replaced. The CT's must be studded for secondary wiring and numbering. The Power transformer fuses on the secondary side must be easily accessible for testing or replacement.

5.5.1.2 A- B1 Ring Main Units12kV

SCHEDULE B1: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Manufacturer Brand Name				
Type				
Total switchgear mass	kg	Total mass with kiosk		
Nominal voltage	kV	12		
Rated voltage	kV	12	4.1.1	
Circuit rated normal current	A	200 to 500Amp (LV fuse Units)	4.3.1.2	
Busbar rated normal current	A	630		
System earthing method	A	NER - 300 A maximum, 20Ω		
Fault breaking capacity	MVA	350		
Fault making capacity	kA	33,4		
Through fault rating for 3 seconds	kA	20		
Standard 1/50 microsecond impulse rating at sea level	kV	95		
Is an indoor or outdoor unit required?		Indoor/outdoor	4.2.1.5	
Is an extensible or non-extensible unit required?		Non- extensible	4.2.2.1	
Degree of protection of unit offered		IPX 4 level	4.2.3.2	
Integral cable earth facility with lock-out mechanism required		Yes	4.2.5.1	
Type of cable testing facility offered		Yes	4.2.5.2	
The insulation medium, or the interruption medium (or both) of switch disconnectors, if there is a preference		Oil, SF6 Gas and vacuum is preferred as insulation medium. Price on both.	4.3.2.1	

SCHEDULE B1: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
The insulating medium, or the interrupting medium (or both) of switch disconnectors offered		Oil, SF6 Gas and vacuum is preferred as insulation medium. Price on both.	4.3.2.2	
Maximum transformer load to be protected	kVA	1000	4.4.2.1	
Rated current of fuse link	Amp	35.5Amp to 90Amp (Max)	4.2.1.5	
Type of fuse link offered		Fuse – Striker pin type HRC HT. Supply with all fuses when delivered. 35.5 A	4.2.2.1	
Dimensions of striker pin fuse link offered		Brand name and dimensions.	4.2.3.2	
Metering CT/PT unit to fit fused isolator		Ratio: 60-30/5 10 VA Class 0.5	4.4.3.2	
Metering Potential Transformer		11kV/110V Star/Star 100VA Class 0.5 Dry type with remote secondary terminals. Low voltage PT fuses must be outside.	4.4.3.3	
Type of protection required on transformer feeder		Fuse– striker pin type HRC HT	4.5.2.1	
What is the insulation medium of the busbar chamber?		Please indicate if oil, Sf6 or Vacuum.	4.6.5	
Is a cable boxes required?		Yes	4.7.1.1	
Air-filled cable box required for dry type terminations.		Air filled, boxes with bolted covers	4.7.1.2	
Cable type		PILC or XLPE	4.7.1.3	
Maximum size(s)		35mm^2, 185 mm^2 and 240mm^2 PILC.		
Dimensions of cable trench: aa) depth bb) width	 mm	 400	4.7.1.4	

SCHEDULE B1: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
	mm	600		
Termination type		Heat Shrink	4.7.2.2	
Are only type C bushings required?		Yes	4.7.4.2	
Required method of clamping the cables		Prove PVC wedge cleats	4.7.5.4	
Is a pressure-checking device required?		Yes, If it is SF6 gas and Oil level glass if it is oil filled.	4.9.3	
Quantity of SF_6	l	Indicate the unit gas pressure.	4.9.5	
Recommended types of tools to install and maintain unit		All special tools must be supplied on order if specified. SF6 gauges and fitting must be supplied with switchgear.	4.14.2	
Method used to attach rating plates		Pop riveted	4.15.1	
Method used to attach labels		Screwed on	4.16.1.1	
Is engraving of main circuit designation labels required?		Must have blank labels on feeders	4.16.2.5	
Colour of unit		Light - grey	4.17.4	
The ring main unit required for a corrosive or a non-corrosive environment?		Corrosive and Non-corrosive environment.	4.17.7	
Details of internal arc tests		Supply test certificates	5.1.3	
Documentation required		Supply all factory tests	5.2(k)	
Number of sets of manuals required, if more than one set		One per each unit delivered.	6.1	
All mounting material necessary to mount the unit is to be supplied with every unit		Packed in box		

Table 29: Ring Main Units12kV

5.5.1.3 B- B2 Ring Main Units 12kV

SCHEDULE B1: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PAR-TICULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Manufacturer brand name				
Type				
Total switchgear mass	kg	Total mass with kiosk		
Nominal voltage	kV	12		
Rated voltage	kV	12	4.1.1	
Circuit rated normal current	A	200 to 500Amp (LV fuse Units)	4.3.1.2	
Busbar rated normal current	A	630		
System earthing method	A	NER - 300 A maximum, 20Ω		
Fault breaking capacity	MVA	350		
Fault making capacity	kA	33,4		
Through fault rating for 3 sec-onds	kA	20		
Standard 1/50 microsecond impulse rating at sea level	kV	95		
Is an indoor or outdoor unit re-quired?		Indoor/outdoor	4.2.1.5	
Is an extensible or non-exten-sible unit required?		Non- extensible	4.2.2.1	
Degree of protection of unit of-fered		IPX 4 level	4.2.3.2	
Integral cable earth facility with lock-out mechanism required		Yes	4.2.5.1	
Type of cable testing facility of-fered		Yes	4.2.5.2	
The insulation medium, or the interruption medium (or both) of switch disconnectors, if there is a preference		Oil, SF6 Gas and vacuum is preferred as insulation medium. Price on both.	4.3.2.1	

SCHEDULE B1: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PAR-TICULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
The insulating medium, or the interrupting medium (or both) of switch disconnectors offered		Oil, SF6 Gas and vacuum is preferred as insulation medium. Price on both.	4.3.2.2	
Maximum transformer load to be protected	kVA	1000	4.4.2.1	
Rated current of fuse link	Amp	35.5Amp to 90Amp (Max)	4.2.1.5	
Type of fuse link offered		Fuse – Striker pin type HRC HT. Supply with all fuses when delivered. 35.5 A	4.2.2.1	
Dimensions of striker pin fuse link offered		Brand name and dimensions.	4.2.3.2	
Metering CT/PT unit to fit fused isolator		Ratio: 60-30/5 10 VA Class 0.5	4.4.3.2	
Metering Potential Trans-former		11kV/110V Star/Star 100VA Class 0.5 Dry type with remote secondary terminals. Low voltage PT fuses must be outside.	4.4.3.3	
Type of protection required on transformer feeder		Fuse– striker pin type HRC HT	4.5.2.1	
What is the insulation medium of the busbar chamber?		Please indicate if oil, Sf6 or Vacuum.	4.6.5	
Is a cable boxes required?		Yes	4.7.1.1	
Air-filled cable box required for dry type terminations.		Air filled, boxes with bolted covers	4.7.1.2	
Cable type		PILC or XLPE	4.7.1.3	
Maximum size(s)		35mm^2, 185 mm^2 and 240mm^2 PILC.		
Dimensions of cable trench: aa) depth bb) width	 mm mm	 400 600	4.7.1.4	

SCHEDULE B1: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Termination type		Heat Shrink	4.7.2.2	
Are only type C bushings required?		Yes	4.7.4.2	
Required method of clamping the cables		Prove PVC wedge cleats	4.7.5.4	
Is a pressure-checking device required?		Yes, If it is SF6 gas and Oil level glass if it is oil filled.	4.9.3	
Quantity of SF_6	l	Indicate the unit gas pressure.	4.9.5	
Recommended types of tools to install and maintain unit		All special tools must be supplied on order if specified. SF6 gauges and fitting must be supplied with switchgear.	4.14.2	
Method used to attach rating plates		Pop riveted	4.15.1	
Method used to attach labels		Screwed on	4.16.1.1	
Is engraving of main circuit designation labels required?		Must have blank labels on feeders	4.16.2.5	
Colour of unit		Light - grey	4.17.4	
The ring main unit required for a corrosive or a non-corrosive environment?		Corrosive and Non-corrosive environment.	4.17.7	
Details of internal arc tests		Supply test certificates	5.1.3	
Documentation required		Supply all factory tests	5.2(k)	
Number of sets of manuals required, if more than one set		One per each unit delivered.	6.1	
All mounting material necessary to mount the unit is to be supplied with every unit		Packed in box		

Table 30: Ring Main Units12kV

5.5.1.4 C- B3 Ring Main Units 12kV

SCHEDULE B1: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Manufacturer brand name				
Type				
Total switchgear mass	kg	Total mass with kiosk		
Nominal voltage	kV	12		
Rated voltage	kV	12	4.1.1	
Circuit rated normal current	A	200 to 500Amp (LV fuse Units)	4.3.1.2	
Busbar rated normal current	A	630		
System earthing method	A	NER - 300 A maximum, 20Ω		
Fault breaking capacity	MVA	350		
Fault making capacity	kA	33,4		
Through fault rating for 3 seconds	kA	20		
Standard 1/50 microsecond impulse rating at sea level	kV	95		
Is an indoor or outdoor unit required?		Indoor/outdoor	4.2.1.5	
Is an extensible or non-extensible unit required?		Non- extensible	4.2.2.1	
Degree of protection of unit offered		IPX 4 level	4.2.3.2	
Integral cable earth facility with lock-out mechanism required		Yes	4.2.5.1	
Type of cable testing facility offered		Yes	4.2.5.2	
The insulation medium, or the interruption medium (or both) of switch disconnectors, if there is a preference		Oil, SF6 Gas and vacuum is preferred as insulation medium. Price on both.	4.3.2.1	

SCHEDULE B1: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
The insulating medium, or the interrupting medium (or both) of switch disconnectors offered		Oil, SF6 Gas and vacuum is preferred as insulation medium. Price on both.	4.3.2.2	
Maximum transformer load to be protected	kVA	1000	4.4.2.1	
Rated current of fuse link	Amp	35.5Amp to 90Amp (Max)	4.2.1.5	
Type of fuse link offered		Fuse – Striker pin type HRC HT. Supply with all fuses when delivered. 35.5 A	4.2.2.1	
Dimensions of striker pin fuse link offered		Brand name and dimensions.	4.2.3.2	
Metering CT/PT unit to fit fused isolator		Ratio: 60-30/5 10 VA Class 0.5	4.4.3.2	
Metering Potential Transformer		11kV/110V Star/Star 100VA Class 0.5 Dry type with remote secondary terminals. Low voltage PT fuses must be outside.	4.4.3.3	
Type of protection required on transformer feeder		Fuse– striker pin type HRC HT	4.5.2.1	
What is the insulation medium of the busbar chamber?		Please indicate if oil, Sf6 or Vacuum.	4.6.5	
Is a cable boxes required?		Yes	4.7.1.1	
Air-filled cable box required for dry type terminations.		Air filled, boxes with bolted covers	4.7.1.2	
Cable type		PILC or XLPE	4.7.1.3	
Maximum size(s)		35mm^2, 185 mm^2 and 240mm^2 PILC.		
Dimensions of cable trench: aa) depth			4.7.1.4	

SCHEDULE B1: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
bb) width	mm mm	400 600		
Termination type		Heat Shrink	4.7.2.2	
Are only type C bushings required?		Yes	4.7.4.2	
Required method of clamping the cables		Prove PVC wedge cleats	4.7.5.4	
Is a pressure-checking device required?		Yes, If it is SF6 gas and Oil level glass if it is oil filled.	4.9.3	
Quantity of SF_6	l	Indicate the unit gas pressure.	4.9.5	
Recommended types of tools to install and maintain unit		All special tools must be supplied on order if specified. SF6 gauges and fitting must be supplied with switchgear.	4.14.2	
Method used to attach rating plates		Pop riveted	4.15.1	
Method used to attach labels		Screwed on	4.16.1.1	
Is engraving of main circuit designation labels required?		Must have blank labels on feeders	4.16.2.5	
Colour of unit		Light - grey	4.17.4	
The ring main unit required for a corrosive or a non-corrosive environment?		Corrosive and Non-corrosive environment.	4.17.7	
Details of internal arc tests		Supply test certificates	5.1.3	
Documentation required		Supply all factory tests	5.2(k)	
Number of sets of manuals required, if more than one set		One per each unit delivered.	6.1	
All mounting material necessary to mount the unit is to be supplied with every unit		Packed in box		

Table 31: Ring Main Units12kV

5.5.1.5 D- B1 Ring Main Units 22kV

SCHEDULE B1: - **METAL ENCLOSED RING MAIN UNITS**				
DESCRIPTION OF PARTIC-ULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Manufacturer brand name				
Type				
Total switchgear mass	kg	Total mass with kiosk		
Nominal voltage	kV	22		
Rated voltage	kV	24	4.1.1	
Circuit rated normal current	A	200 to 500Amp (LV fuse Units)	4.3.1.2	
Busbar rated normal current	A	630		
System earthing method	A	NER - 300 A maximum, 20Ω		
Fault breaking capacity	MVA	350		
Fault making capacity	kA	33,4		
Through fault rating for 3 seconds	kA	20		
Standard 1/50 microsecond im-pulse rating at sea level	kV	95		
Is an indoor or outdoor unit re-quired?		Indoor/outdoor	4.2.1.5	
Is an extensible or non-extensible unit required?		Non- extensible	4.2.2.1	
Degree of protection of unit offered		IPX 4 level	4.2.3.2	
Integral cable earth facility with lock-out mechanism required		Yes	4.2.5.1	
Type of cable testing facility offered		Yes	4.2.5.2	
The insulation medium, or the inter-ruption medium (or both) of switch disconnectors, if there is a prefer-ence		Oil, SF6 Gas and vacuum is preferred as insula-tion medium. Price on both.	4.3.2.1	

SCHEDULE B1: - **METAL ENCLOSED RING MAIN UNITS**				
DESCRIPTION OF PARTIC-ULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
The insulating medium, or the inter-rupting medium (or both) of switch disconnectors offered		Oil, SF6 Gas and vacuum is preferred as insula-tion medium. Price on both.	4.3.2.2	
Maximum transformer load to be protected	kVA	1000	4.4.2.1	
Rated current of fuse link	Amp	35.5Amp to 90Amp (Max)	4.2.1.5	
Type of fuse link offered		Fuse – Striker pin type HRC HT. Supply with all fuses when delivered. 35.5 A	4.2.2.1	
Dimensions of striker pin fuse link offered		Brand name and dimensions.	4.2.3.2	
Metering CT/PT unit to fit fused iso-lator		Ratio: 60-30/5 10 VA Class 0.5	4.4.3.2	
Metering Potential Transformer		11kV/110V Star/Star 100VA Class 0.5 Dry type with remote secondary terminals. Low voltage PT fuses must be outside.	4.4.3.3	
Type of protection required on transformer feeder		Fuse– striker pin type HRC HT	4.5.2.1	
What is the insulation medium of the busbar chamber?		Please indicate if oil, Sf6 or Vacuum.	4.6.5	
Is a cable boxes required?		Yes	4.7.1.1	
Air-filled cable box required for dry type terminations.		Air filled, boxes with bolted covers	4.7.1.2	
Cable type		PILC or XLPE	4.7.1.3	
Maximum size(s)		35mm^2, 185 mm^2 and 240mm^2 PILC.		
Dimensions of cable trench: aa) depth bb) width	 mm mm	 400 600	4.7.1.4	
Termination type		Heat Shrink	4.7.2.2	

SCHEDULE B1: - **METAL ENCLOSED RING MAIN UNITS**				
DESCRIPTION OF PARTIC-ULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Are only type C bushings required?		Yes	4.7.4.2	
Required method of clamping the cables		Prove PVC wedge cleats	4.7.5.4	
Is a pressure-checking device required?		Yes, If it is SF6 gas and Oil level glass if it is oil filled.	4.9.3	
Quantity of SF_6	l	Indicate the unit gas pressure.	4.9.5	
Recommended types of tools to install and maintain unit		All special tools must be supplied on order if specified. SF6 gauges and fitting must be supplied with switchgear.	4.14.2	
Method used to attach rating plates		Pop riveted	4.15.1	
Method used to attach labels		Screwed on	4.16.1.1	
Is engraving of main circuit designation labels required?		Must have blank labels on feeders	4.16.2.5	
Colour of unit		Light - grey	4.17.4	
The ring main unit required for a corrosive or a non-corrosive environment?		Corrosive and Non-corrosive environment.	4.17.7	
Details of internal arc tests		Supply test certificates	5.1.3	
Documentation required		Supply all factory tests	5.2(k)	
Number of sets of manuals required, if more than one set		One per each unit delivered.	6.1	
All mounting material necessary to mount the unit is to be supplied with every unit		Packed in box		

Table 32: Ring Main Units22kV

5.5.1.6 E- B2 Ring Main Units 22kV

SCHEDULE B2: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICU-LARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Manufacturer				
Country of origin				
Catalogue/Type designation				
Total switchgear mass	kg	Total mass with kiosk		
Nominal voltage	kV	22		
Rated voltage	kV	24	4.1.1	
Circuit rated normal current	A	200 to 500Amp (LV fuse Units)	4.3.1.2	
Busbar rated normal current	A	630		
System earthing method	A	NER - 300 A maximum, 20Ω		
Fault breaking capacity	MVA	350		
Fault making capacity	kA	33,4		
Through fault rating for 3 seconds	kA	20		
Standard 1/50 microsecond impulse rating at sea level	kV	95		
Is an indoor or outdoor unit re-quired?		Indoor/outdoor	4.2.1.5	
Is an extensible or non-extensible unit required?		Non- extensible	4.2.2.1	
Degree of protection of unit offered			4.2.3.2	
Integral cable earth facility with lock-out mechanism required		Yes	4.2.5.1	
Type of cable testing facility offered		1	4.2.5.2	
The insulation medium, or the inter-ruption medium (or both) of switch disconnectors, if there is a prefer-ence		SF6 Gas and Vacuum is preferred as insulation medium. Price on both.	4.3.2.1	
The insulating medium, or the inter-rupting medium (or both) of switch disconnectors offered		SF6 Gas and Vacuum is preferred as insulation medium. Price on both.	4.3.2.2	

SCHEDULE B2: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICU-LARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Maximum transformer load to be protected	kVA	1000	4.4.2.1	
Rated current of fuse link	A	35.5 to 63 (Max)	4.2.1.5	
Type of fuse link offered		Fuse – Striker pin type HRC HT	4.2.2.1	
Dimensions of fuse link offered			4.2.3.2	
Metering CT/PT unit to fit fused iso-lator		60-30/5 10 VA Class 0.5	4.4.3.2	
Metering Potential Transformer		22kV/110V Star/Star 100VA Class 0.5 Dry type with remote secondary terminals. Low voltage PT fuses must be outside.	4.4.3.3	
Type of protection required on trans-former feeder		Fuse– striker pin type HRC HT	4.5.2.1	
What is the insulation medium of the busbar chamber?			4.6.5	
Is a cable boxes required?		Yes	4.7.1.1	
Compound-filled or air-filled cable box required?		Air filled	4.7.1.2	
Cable type		PILC or XLPE	4.7.1.3	
Maximum size(s)		35mm to 185 mm		
Dimensions of cable trench: aa) depth bb) width	 mm mm	 400 600	4.7.1.4	
Termination type		Heat Shrink	4.7.2.2	
Are only type C bushings required?		Yes	4.7.4.2	
Are the accessories for cable termi-nations to be supplied		No	4.7.5.1	
Are cable glands to be insulated and fitted with an earth strap?		No	4.7.5.2	

SCHEDULE B2: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICU-LARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Required method of clamping the cables		PVC wedge cleats	4.7.5.4	
Is a pressure-checking device required?		Yes, If it is SF6 gas and Oil level glass if it is oil filled.	4.9.3	
Quantity of SF_6	l	Indicate the unit gas pressure.	4.9.5	
Recommended types of tools to install and maintain unit		All special tools must be supplied on order if specified. SF6 gauges and fitting must be supplied with switchgear.	4.14.2	
Method used to attach rating plates		Screwed on	4.15.1	
Method used to attach labels		Screwed on	4.16.1.1	
Is engraving of main circuit designation labels required?		No	4.16.2.5	
If yes, state details		Leave it blank		
Colour of unit		Light - grey	4.17.4	
Is the ring main unit required for a corrosive or a non-corrosive environment?		Non-corrosive	4.17.7	
Details of internal arc tests		Supply test certificates	5.1.3	
Documentation required		Supply all factory tests	5.2(k)	
Number of sets of manuals required, if more than one set		One per each unit delivered.	6.1	
All mounting material necessary to mount the unit is to be supplied with every unit				

Table 33: Ring Main Units22kV

5.5.1.7 F- B3 Ring Main Units 12kV

SCHEDULE B2: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICU-LARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PAR-TICLURES OFFERED**
Manufacturer				
Country of origin				
Catalogue/Type designation				
Total switchgear mass	kg	Total mass with kiosk		
Nominal voltage	kV	22		
Rated voltage	kV	24	4.1.1	
Circuit rated normal current	A	200 to 500Amp (LV fuse Units)	4.3.1.2	
Busbar rated normal current	A	630		
System earthing method	A	NER - 300 A maximum, 20Ω		
Fault breaking capacity	MVA	350		
Fault making capacity	kA	33,4		
Through fault rating for 3 seconds	kA	20		
Standard 1/50 microsecond impulse rating at sea level	kV	95		
Is an indoor or outdoor unit re-quired?		Indoor/outdoor	4.2.1.5	
Is an extensible or non-extensible unit required?		Non- extensible	4.2.2.1	
Degree of protection of unit offered			4.2.3.2	
Integral cable earth facility with lock-out mechanism required		Yes	4.2.5.1	
Type of cable testing facility offered		1	4.2.5.2	
The insulation medium, or the inter-ruption medium (or both) of switch disconnectors, if there is a prefer-ence		SF6 Gas and Vacuum is preferred as insulation medium. Price on both.	4.3.2.1	
The insulating medium, or the inter-rupting medium (or both) of switch disconnectors offered		SF6 Gas and Vacuum is preferred as insulation medium. Price on both.	4.3.2.2	

SCHEDULE B2: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICU-LARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PAR-TICLURES OFFERED**
Maximum transformer load to be protected	kVA	1000	4.4.2.1	
Rated current of fuse link	A	35.5 to 63 (Max)	4.2.1.5	
Type of fuse link offered		Fuse – Striker pin type HRC HT	4.2.2.1	
Dimensions of fuse link offered			4.2.3.2	
Metering CT/PT unit to fit fused iso-lator		60-30/5 10 VA Class 0.5	4.4.3.2	
Metering Potential Transformer		22kV/110V Star/Star 100VA Class 0.5 Dry type with remote secondary terminals. Low voltage PT fuses must be outside.	4.4.3.3	
Type of protection required on trans-former feeder		Fuse– striker pin type HRC HT	4.5.2.1	
What is the insulation medium of the busbar chamber?			4.6.5	
Is a cable boxes required?		Yes	4.7.1.1	
Compound-filled or air-filled cable box required?		Air filled	4.7.1.2	
Cable type		PILC or XLPE	4.7.1.3	
Maximum size(s)		35mm to 185 mm		
Dimensions of cable trench: aa) depth bb) width	 mm mm	 400 600	4.7.1.4	
Termination type		Heat Shrink	4.7.2.2	
Are only type C bushings required?		Yes	4.7.4.2	
Are the accessories for cable termi-nations to be supplied		No	4.7.5.1	
Are cable glands to be insulated and fitted with an earth strap?		No	4.7.5.2	

SCHEDULE B2: - METAL ENCLOSED RING MAIN UNITS				
DESCRIPTION OF PARTICULARS:	**UNITS**	**SPECIFIEID REQUIREMENTS**	**SANS 1874 CLUASES**	**MANUFACTURER, MAKE, TYPE AND INDICATE THE PARTICLURES OFFERED**
Required method of clamping the cables		PVC wedge cleats	4.7.5.4	
Is a pressure-checking device required?		Yes, If it is SF6 gas and Oil level glass if it is oil filled.	4.9.3	
Quantity of SF_6	l	Indicate the unit gas pressure.	4.9.5	
Recommended types of tools to install and maintain unit		All special tools must be supplied on order if specified. SF6 gauges and fitting must be supplied with switchgear.	4.14.2	
Method used to attach rating plates		Screwed on	4.15.1	
Method used to attach labels		Screwed on	4.16.1.1	
Is engraving of main circuit designation labels required?		No	4.16.2.5	
If yes, state details		Leave it blank		
Colour of unit		Light - grey	4.17.4	
Is the ring main unit required for a corrosive or a non-corrosive environment?		Non-corrosive	4.17.7	
Details of internal arc tests		Supply test certificates	5.1.3	
Documentation required		Supply all factory tests	5.2(k)	
Number of sets of manuals required, if more than one set		One per each unit delivered.	6.1	
All mounting material necessary to mount the unit is to be supplied with every unit				

Table 34: Ring Main Units22kV

5.5.2 A Supply and/or repairs of NULEC N-series ACR N12 and E-series ACR Pole mounted Automatic Circuit Reclosing Breakers (12kV). (Existing Switchgear)

The N-Series three phase pole/structure mounted auto recloser circuit breaker, must be Sf6 gas filled with vacuum arc interrupters. Supply with integrated CT's and Vt's and with remote control complete with all the brackets and small cabling. Complete with pole top and communication cubicle. **The replacement of the existing Switchgear and Control Panels, with equivalent and compatible equipment, is required should the existing equipment be discontinued or obsolete.**

ITEM	DESCRIPTION	SPECIFIEID REQUIREMENTS	MANUFACTURER BRAND NAME AND TYPE
1.	Rated Voltage	15 kV	
2.	Rated Short circuit current	16kA	
3.	Rated Load Current	800Amp	
4.	Stainless Steel Tank	316 grades, Sf6 gas filled	
5.	Arc Interruption	Vacuum	
6.	Battery back up	24 VDC (2X12VDC, 7Ah)	
7.	Battery charger	24VDC	
8.	Sf6 gas refill kit Nulec	Connecting fittings, pipes and gauges. Complete set.	
9.	SCADA	Supporting DNP3 Protocol – Level 2	

Table 35: Supply and/or repairs of NULEC N-series ACR N12 and E-series ACR Pole mounted Automatic Circuit Reclosing Breakers (12kV).

5.5.3 B Supply and/or repairs of the existing NULEC N-series ACR N12 and E-series ACR Pole mounted Automatic Circuit Reclosing Breakers (22kV).

The N-Series three phase pole/structure mounted auto recloser circuit breaker, must be Sf6 gas filled with vacuum arc interrupters. Supply with integrated CT's and Vt's and with remote control complete with all the brackets and small cabling. Complete with pole top and communication cubicle. **The replacement of the existing Switchgear and Control Panels, with equivalent and compatible equipment, is required should the existing equipment be discontinued or obsolete.**

ITEM	DESCRIPTION	SPECIFIEID REQUIREMENTS	MANUFACTURER BRAND NAME AND TYPE
1.	Rated Voltage	24 kV	
2.	Rated Short circuit current	16kA	
3.	Rated Load Current	800Amp	
4.	Stainless Steel Tank	316 grades, Sf6 gas filled	
5.	Arc Interruption	Vacuum	
6.	Battery back up	24 VDC (2X12VDC, 7Ah)	
7.	Battery charger	24VDC	
8.	Sf6 gas refill kit Nulec	Connecting fittings, pipes and gauges. Complete set.	
9.	SCADA	Supporting DNP3 Protocol – Level 2	

Table 36: Supply and/or repairs of NULEC N-series ACR N12 and E-series ACR Pole mounted Automatic Circuit Reclosing Breakers (24kV).

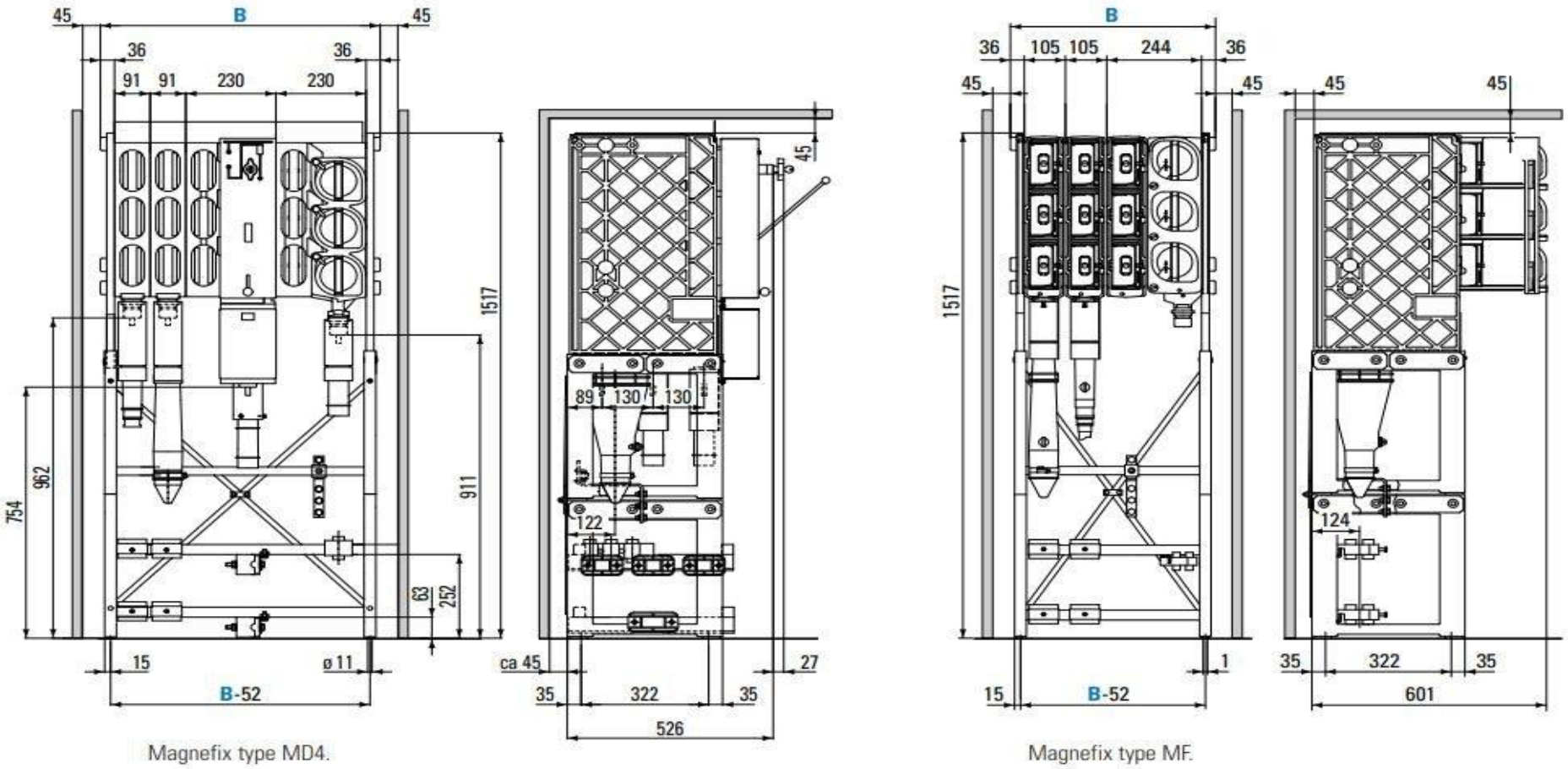
5.5.4 A Magnefix / Interswitch Type MF disconnector switch 12kV. Existing switchgear.

The Magnefix MF disconnector switches must be supplied complete with brackets and fuses to fit in a miniature substation HT kiosk.

MAGNEFIX TYPE MF						
1.	Cable unit	105 mm				
2.	Busbar connection unit	105 mm				
3.	Cable unit for top connection	210 mm				
4.	Busbar Sectionalizer	210 mm				
5.	Fuse protection tee-off	244 mm (30.5 Amp fuses)				
6.	Circuit-breaker protection tee-off	-				
7.	Total width calculations	B = C x 105 + T x 244 + 72				
(C= number of cable units, T = number of protected tee-offs)						
	Magnefix type MF					
1.	Normal current	A	450	450	450	450
2.	Mainly active load breaking current	A	450	450	450	450

MAGNEFIX TYPE MF						
3.	Short-circuit making current peak value	kA	50	50	50	50
4.	Short time withstand current	kV - 1s	20	20	20	20
5.	Earth fault breaking current	A	240	240	240	240
6.	Cable charging breaking current	A	25	25	25	25
7.	Normal current	A	450	450	450	450

Table 37: Supply and/or repairs of NULEC N-series ACR N12 and E-series ACR Pole mounted Automatic Circuit Re-closing Breakers 12kV



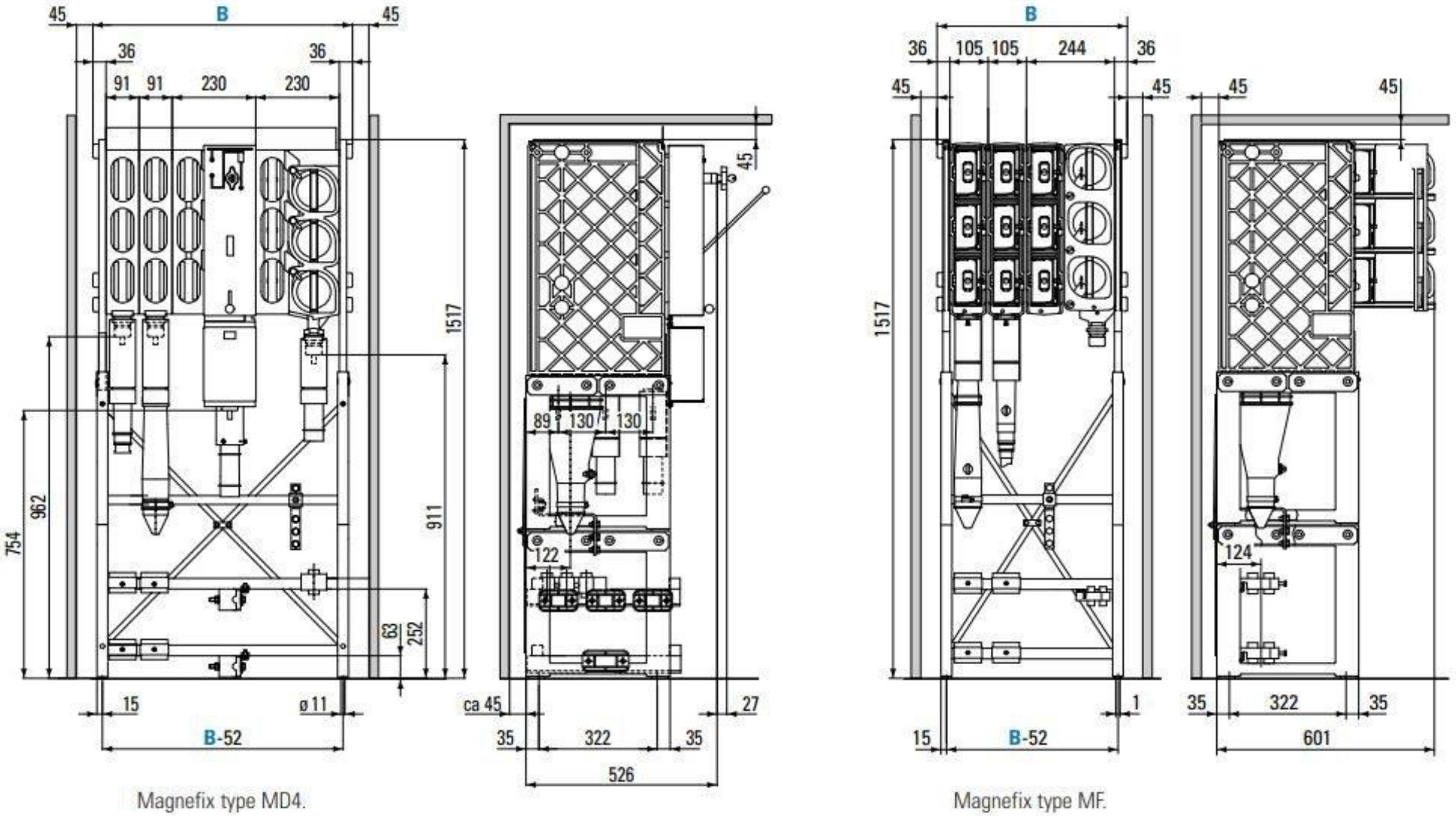
Drawing 1: Picture on the right Magnefix MF

5.5.5 B Magnefix / Interswitch Type MF disconnector switch 22kV

The Magnefix MF disconnector switches must be supplied complete with brackets and fuses to fit in a miniature substation HT kiosk.

MAGNEFIX TYPE MF						
8.	Cable unit	105 mm				
9.	Busbar connection unit	105 mm				
10.	Cable unit for top connection	210 mm				
11.	Busbar Sectionalizer	210 mm				
12.	Fuse protection tee-off	244 mm (30.5 Amp fuses)				
13.	Circuit-breaker protection tee-off	Fuses HRC STRIKER PIN				
14.	Total width calculations	B = C x 105 + T x 244 + 72				
(C= number of cable units, T = number of protected tee-offs)						
	Magnefix type MF					
8.	Normal current	A	450	450	450	450
9.	Mainly active load breaking current	A	450	450	450	450
10.	Short-circuit making current peak value	kA	50	50	50	50
11.	Short time withstand current	kV - 1s	20	20	20	20
12.	Earth fault breaking current	A	240	240	240	240
13.	Cable charging breaking current	A	25	25	25	25
14.	Normal current	A	450	450	450	450

Table 38: B Magnefix / Interswitch Type MF disconnector switch 22kV



Drawing 2: Picture on the right Magnefix MF 22kV

5.5.6 **Part C: Existing Switchgear.** Vacuum circuit breakers to replace AG16 oil type circuit breakers and the repairs of 12kV switchgear on Adhoc quotation bases. (Retrofit)The service provider will be responsible for “strip and quote” quotations on repairs of 11kVand 22kV switchgear and related equipment and the transport from Bloemfontein to their premises and back.

SCHEDULE C1: VACUUM CIRCUIT BREAKER REPAIR AND RETROFIT (NOTE: No alternations to panel will be allowed, the new vacuum breaker must fit in existing panel)

5.5.7 **A. Existing Switch Gear GEC, AG16, to vacuum.**

DESCRIPTION OF PARTICULARS	UNITS	SPECIFIED REQUIREMENT	SANS 1874 CLAUSE	Type AG16 retrofit to vacuum
Manufacturer			**IEC62271-200 / 03**	
Type				
Total switchgear mass	kg			
Nominal voltage	kV	11		
Rated voltage	kV	12	4.1.1	
Circuit rated normal current	A	800	4.3.1.2	
Busbar rated normal current	A	800		
Fault breaking capacity	MVA	350		
Fault making capacity	kA	33,4		
Through fault rating for 3 seconds	kA	20 kA		
Standard 1/50 microsecond impulse rating at sea level	kV	95		
Circuit Breaker to fit Panel		GEC type AG16 (without any alternations to the existing panel)		

Table 39: Existing Switch Gear GEC, AG16, to vacuum

5.5.8 **B. Existing Switchgear Reyrolle LMS, LMR, LMT to VD4-LMT ABB-Reyrolle CB. (Vacuum) or equivalent manufacturing.**

DESCRIPTION OF PARTICULARS	UNITS	SPECIFIED REQUIREMENT	SANS 1874 CLAUSE	VD4-LMT ABB-Reyrolle
Manufacturer Brand Name				
Type				

DESCRIPTION OF PARTICULARS	UNITS	SPECIFIED REQUIREMENT	SANS 1874 CLAUSE	VD4-LMT ABB-Reyrolle
Total switchgear mass	kg			
Nominal voltage	kV	11		
Rated voltage	kV	12	4.1.1	
Circuit rated normal current	A	1250	4.3.1.2	
Busbar rated normal current	A	1250		
Fault breaking capacity	MVA	350		
Fault making capacity	kA	31.5		
Through fault rating for 3 seconds	kA	25 kA		
Standard 1/50 microsecond impulse rating at sea level	kV	95		
Circuit Breaker to fit Panel		Circuit Breaker to fit in existing panel without alternations to panel.		
Replacement of Reyrolle, GEC AG16 Panel, Current transformers and Voltage Transformers.(Dry Type resin)				
Reyrolle Panel complete with busbars and shutters.	A	1250		
VOLTAGE TRANSFORMER				
Install VT		Yes	4.9	
Ratio		11000/110/63.5 Volts		
Burden and Accuracy		100 VA Class 0.5		
Voltage Factor		1.9		
CURRENT TRANSFORMERS:		**Studded 6mm Brass, S, connections.**		
Install CT's		Yes		
Purpose		OC / EF	4.8	
Ratio		600/1		
Burden		10VA		
Class		5P20		
Quantity		3		

DESCRIPTION OF PARTICULARS	UNITS	SPECIFIED RE-QUIREMENT	SANS 1874 CLAUSE	VD4-LMT ABB-Reyrolle
Insulation Level		IL 12/28/95 KV		
Install Ct's (Differential)		Yes		
Purpose		Diff	4.8	
Burden				
Ratio		600/1		
Class		X or PX		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install test block PK2-4way		YES (OC/EF)		
Install Ct's (Metering)		YES		
Purpose		Metering	4.8	
Burden		600/300/200/1		
Ratio		10VA		
Class		0.5		
Quantity		3		
Insulation Level		IL 12/28/95 KV		
Install test block PK2-4way		YES (Diff / Meter-ing)		
Required method of clamping the cables		PVC wedge cleats	4.7.5.4	

Table 40: Existing Switchgear Reyrolle LMS, LMR, LMT to VD4-LMT ABB-Reyrolle CB

5.5.9 **Existing Switch Gear. The following Existing Circuit breakers must be repaired: (Strip &Quote)**

Make	Type
Reyrolle LMS	LMS/X1/QMRO
Reyrolle LMR	LMR/X2/QMRO
Reyrolle LMT	LMT2/X31/QM
Actom	SBV4E/2000/25/SI
Johnson & Phillips	PDB/A/2Z and TSB16
GEC	PDB/A/400
HAWKER SIDDELEY	VIL-6 and R4/1 and V4/1 and D6XD
FIRST ELECTRIC	JB621
BRUSH	W4/11 and S4
LONG & CRAWFORD	AVS2
ALSTOM	AGVB-800/20/S and SBV4/800/20-S1
SACE BERGAMO	RM1235

Make	Type
BRITISH THOMPSON	BTH/JB621 and LC/B3
BRUSH	W4/11
NULEC	N24S-ACR-SF6-24-12-150
JG STATTER	VTGR150
YORKSHIRE	YSF6
RMU Actom	K3 oil and gas
RMU Magenefix	Dry Type Air
RMU GEC	T3 oil
RMU ABB	Gas
RMU Schneider	Gas
RMU Tiger	oil
Nulec Switchgear outdoor pole mounted.	Sf6 Gas

Table 41: Existing Circuit breakers to be repaired.

5.5.10 **Supply of switching- and spring charges handles on the following types of existing switchgear.**

Make	Type
Reyrolle LMS	LMS/X1/QMRO
Reyrolle LMR	LMR/X2/QMRO
Reyrolle LMT	LMT2/X31/QM
Actom	SBV4E/2000/25/SI
Johnson & Phillips	PDB/A/2Z and TSB16
GEC	PDB/A/400
HAWKER SIDDELEY	VIL-6 and R4/1 and V4/1 and D6XD
FIRST ELECTRIC	JB621
BRUSH	W4/11 and S4
LONG & CRAWFORD	AVS2
ALSTOM	AGVB-800/20/S and SBV4/800/20-S1
SACE BERGAMO	RM1235
BRITISH THOMPSON	BTH/JB621 and LC/B3
BRUSH	W4/11
NULEC	N24S-ACR-SF6-24-12-150
JG STATTER	VTGR150
YORKSHIRE	YSF6
RMU Actom	K3 oil and gas
RMU Magenefix	Dry Type Air
RMU GEC	T3 oil
RMU ABB	Gas

Make	Type
RMU Schneider	Gas
RMU Tiger	oil
Nulec switchgear outdoor pole mounted.	Sf6 Gas
Supply a lockable steel cabinet to accommodate all the above handles.	Steel wall mounted cabinet.

Table 42: Switching- and spring charges handles

5.5.11 **Supply 1100/110V/ 63.5 V Voltage Transformers on existing equipment.**

VOLTAGE TRANSFORMER	REQUIRED SPECIFICATION	SANS	EXISTING VT'S BRAND NAME AND TYPE
GEC, Type AG16			
Install VT	Yes	4.9	
Ratio	11000/110/63.5 Volts		
Burden and Accuracy	100 VA Class 0.5		
Voltage Factor	1.9		
Top plate VT cable side			
VT raiser busbars	12kV Insulated		
Actom, Type SBV3&4			
Install VT	Yes	4.9	
Ratio	11000/110/63.5 Volts		
Burden and Accuracy	100 VA Class 0.5		
Voltage Factor	1.9		
Top plate VT cable side			
VT raiser busbars	12kV Insulated		
Hawker Siddeley Type: VIL-6 and R4/1 and V4/1 and D6XD			
Install VT	Yes	4.9	
Ratio	11000/110/63.5 Volts		
Burden and Accuracy	100 VA Class 0.5		
Voltage Factor	1.9		
Top plate VT cable side			
VT raiser busbars	12kV Insulated		
Reyrolle Types: LMR, LMT and LMS			
Install VT	Yes	4.9	
Ratio	11000/110/63.5 Volts		
Burden and Accuracy	100 VA Class 0.5		
Voltage Factor	1.9		
Top plate VT cable side			
VT raiser busbars	12kV Insulated		

VOLTAGE TRANSFORMER	REQUIRED SPECIFICATION	SANS	EXISTING VT'S BRAND NAME AND TYPE
Yorkshire Type: Ysf6			
Install VT	Yes	4.9	
Ratio	11000/110/63.5 Volts		
Burden and Accuracy	100 VA Class 0.5		
Voltage Factor	1.9		
Top plate VT cable side			
VT raiser busbars	12kV Insulated		

Table 43: Voltage Transformers on existing equipment.

5.5.12 **Supply Protective Relays on existing equipment.**

ITEM	DESCRIPTION	Brand Name
1.	**Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)** i. **Power Supply:** Universal – 24 to 120V DC/AC. ii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. iii. **Voltage Input**: 110V phase to phase AC Voltage. iv. **Configurable labels**: Yes, optional other type of labelling acceptable. v. **Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: 1 x Serial Port vi. **Communications Protocol**: DNP3_level 2 minimum vii. **Digital opto- isolated Inputs**: Minimum of 8. Universal – 24 to 120V DC/AC voltage application (External wetting); Inputs should be individually user-configured to operate. viii. **Digital opto-isolated high speed and high current Outputs**: Minimum of 6A continuous – Minimum of 5. Universal – 24 to 120V DC/AC voltage application. ix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. xii. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). x. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.	
2.	Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state	
3.	3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state	
4.	Transformer Over Temperature tripping relay Hand reset Flag or LEDs	

ITEM	DESCRIPTION	Brand Name
5.	Arc Flash Sensors	
6.	Number of copies for instruction manual issued with the relay on delivery	
7.	**Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT), Sensitive Earth Fault and Auto Reclosing.** i. **Power Supply:** Universal – 24 to 48VDC ii. **Secondary Input Current:**3 x AC 1A plus a 50mA Neutral Input. iii. **Voltage Input**: $V_{NOM\ (L-L)}$ should have the following specifications: 20 to 440V for DELTA_Y for DELTA and WYE iv. **Configurable labels**: Yes v. **Programmable pushbuttons**: Minimum of four programable pushbuttons, each with programable LEDs vi. **Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: 1 x Serial Port vii. **Communications Protocol**: DNP3 level 2 minimum. viii. **Digital Optoisolated Inputs**: Minimum of 8. Universal – 24VDC (External wetting); Inputs should be individually user-configured to operate. ix. **High Speed, High current Interruption (Outputs)**: Minimum of 6A continuous current – Minimum of 8 Universal – 19.2 to 60 VDC for the 24 to 48 power supply. x. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. xi. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay).	
8.	Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state	
9.	3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state	
10.	50mA neutral SEF Element Relay 30VDC. (Only the card alone)	
11.	1Amp OC/EF Element for the Relay, 30V DC. (Only the card alone)	
12.	Transformer Over Temperature tripping relay Hand reset Flag or LEDs	
13.	**Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT), Sensitive Earth Fault and Auto Reclosing.** i. **Power Supply:** Universal – 110 to 120 VDC ii. **Secondary Input Current:**3 x AC 1A plus a 50mA Neutral Input.	

ITEM	DESCRIPTION	Brand Name
	iii. **Voltage Input**: $V_{NOM\ (L-L)}$ should have the following specifications: 20 to 440V for DELTA_Y for DELTA and WYE iv. **Configurable labels**: Yes v. **Programmable pushbuttons**: Minimum of four programable pushbuttons, each with programable LEDs vi. **Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: 1 x Serial Port vii. **Communications Protocol**: DNP3 level 2 minimum. viii. **Digital Optoisolated Inputs**: Minimum of 8. Universal – 110V DC (External wetting); Inputs should be individually user-configured to operate. ix. **High Speed, High current Interruption (Outputs)**: Minimum of 6A continuous current – Minimum of 8 Universal – 110V DC for the 110V DC power supply. x. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. xi. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.	
14.	Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state	
15.	3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state	
16.	Transformer Over Temperature tripping relay Hand reset Flag or LEDs	
17.	Number of copies for instruction manual issued with the relay on delivery	
18.	**Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT), Sensitive Earth Fault and Auto Reclosing with a minimum of 8 pushbuttons.** i. **Power Supply:** Universal – 125Vdc or 120 Vac ii. **Secondary Input Current:** 1 Amp Phase, 1 Amp Neutral; 5Amp Phase, 5Amp Phase;1Amp Phase, 0.05Amp Neutral (nondirectional Sensitive Earth fault [SEF]). iii. **Voltage Input:** No iv. **Configurable labels:** Yes v. **Pushbuttons:** Minimum of eight operator control push buttons; Trip/Close Pushbuttons vi. **Front panel LEDs:** Status and Trip Target LEDs **vii. Communication Ports:** **Rear:** 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front:** 1 x Serial Port; EIA-485 viii. **Firmware:** Includes Mirrored Bits and Load Profile.	

ITEM	DESCRIPTION	Brand Name
	ix. **Communications Protocol:** Should have the following protocols: DNP 3.00 Level 2 Slave, standard protocols; IEC 61850 x. **Digital Optoisolated Inputs:** Minimum of 16 – 110 Vac/Vdc digital inputs with an pickup 88–132 Vdc; Dropout 66 Vdc (External wetting); Inputs should be individually user-configured to operate. xi. **High Speed, High current Interruption (Outputs):** Minimum of 15 Universal outputs with the following criteria: Make: 30 A; Carry: 6 A continuous carry; MOV Protection: 270 Vac/360 Vdc; 40 J; xii. **Arc Flash capability**: No xiii. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xiv. **Protection elements:** Phase Fault Overcurrent Protection; Adaptive Phase Overcurrent Elements; Ground Fault Over-current Protection; Directional Ground Protection; Under- and Overvoltage Elements; Under- and Over frequency Protection; Rate-of-Change-of-Frequency Protection; Harmonic Blocking; Sequence Voltage Elements; Fault Locator xv. **Relay Logic/Automation:** Relay should have: local control logic points; remote control logic points; latching logic points; counters; math variables; logic variables; timers xvi. **Monitoring and reporting:** Event Reporting and Sequential Events Recorder (SER)	
19.	Number of copies for instruction manual issued with the relay on delivery	
20.	**Busbar Protection Relay that may have additional Protection capabilities.** i. **Power Supply:** Universal – 48/125 Vdc or 110-120 Vac ii. **Mainboard Input Voltage:** 110 Vdc iii. **Secondary Input Current:** 1 Amp Phase, 1 Amp Neutral. iv. **Voltage Input:** 3 AC Voltage, 21 AC Current v. **Configurable labels:** Yes vi. **Programmable pushbuttons:** Trip/Close Pushbuttons; 8 operator control pushbuttons vii. **Front panel LEDs:** Status and Trip Target LEDs (minimum of 16) viii. **Communication Ports:** **Rear:** Ethernet Card with Two 10/100 base-T plus 1 x 1 RS 232 port **Front:** 1 x Serial Port; EIA-485 ix. **Firmware:** Includes Mirrored Bits and Load Profile.	

ITEM	DESCRIPTION	Brand Name
	x. **Communications Protocol:** Should have the following protocols: DNP 3.00 Level 2 Slave, FTP, Telnet, and DNP3 LAN/WAN xi. **Digital Optoisolated Inputs:** Minimum of 16 – 110 Vac/Vdc digital inputs with an pickup 88–132 Vdc; Dropout 66 Vdc (External wetting); Inputs should be individually user-configured to operate. xii. **High Speed, High current Interruption (Outputs):** Minimum of 15 Universal outputs with the following criteria: Make: 30 A; Carry: 6 A continuous carry; MOV Protection: 270 Vac/360 Vdc; 40 J; xiii. **Arc Flash capability:** No xiv. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xv. **Protection elements:** Phase Fault Overcurrent Protection; Adaptive Phase Overcurrent Elements; Ground Fault Over-current Protection; Directional Ground Protection; Under- and Overvoltage Elements; Under- and Over frequency Protection; Rate-of-Change-of-Frequency Protection; Har-monic Blocking; Sequence Voltage Elements; Fault Loca-tor xvi. **Relay Logic/Automation: Relay should have:** local control logic points; remote control logic points; 2 latching logic points; counters; math variables; logic variables; tim-ers xvii. **Monitoring and reporting**: Event Reporting and Sequen-tial Events Recorder (SER)	
21.	Number of copies for instruction manual issued with the relay on delivery	
22.	**Transformer Differential Protection Relay that may have additional Protection capabilities.** i. **Power Supply:** Universal – 125/250 Vdc or Vac; 85–350 Vdc or 85–264 Vac ii. **AC Secondary Input Current:** Secondary Input Current 1 Amp Phase, 1 Amp Neutral, including 2xREF Element; 3 A continuous, 100 A for 1 s; iii. **Voltage Input:** No iv. **Configurable labels:** No v. **Front panel LEDs:** Status and Trip Target LEDs vi. **Programmable pushbuttons:** Minimum of eight operator control pushbuttons vii. **Communication Ports:** **Rear:** 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front:** 1 x Serial Port viii. **Communications Protocol:** Should have the following protocols: DNP 3.00 Level 2 Slave,	

ITEM	DESCRIPTION	Brand Name
	ix. **Digital Optoisolated Inputs:** Minimum of 16 – 110 Vac/Vdc digital inputs with an pickup 88–132 Vdc; Dropout 66 Vdc (External wetting); Inputs should be individually user-configured to operate. x. **High Speed, High current Interruption (Outputs):** Minimum of 15 Universal outputs with the following criteria: Make: 30 A; Carry: 6 A continuous carry; MOV Protection: 270 Vac/360 Vdc; 40 J; xi. **Arc Flash capability:** No xii. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xiii. **Relay Logic/Automation:** Relay should have local control logic points; remote control logic points; latching logic points; counters; math variables; logic variables; timers xiv. **Monitoring and reporting:** Event Reporting and Sequential Events Recorder (SER) **Protection elements:** Relay should have the following protection elements: Percentage Differential Protection; Harmonic and DC Elements; Unrestrained Differential Protection; Overcurrent Fault Protection; Restricted Earth Fault Protection; Through-Fault Event Monitor; CT Phase Angle Compensation	
23.	Number of copies for instruction manual issued with the relay on delivery	
24.	**Line Differential Protection Relay that may have additional Protection capabilities.** i. **Power Supply:** Universal – 48/125 Vdc or 125 Vac; Range: 85–350 Vdc or 85–264 Vac ii. **AC Secondary Input Current:** Secondary Input Current 1 Amp Phase, 1 Amp Neutral; Input Current 5 Amp Phase, 5 Amp Neutral, iii. **Voltage Input:** Wye-Connected Va, Vb and Vc (150 Va Maximum Phase-Neutral; channel Vs also rated to 150 Vac) iv. **Configurable labels:** No v. **Front panel LEDs:** Status and Trip Target LEDs vi. **Programmable pushbuttons:** Minimum of eight operator control pushbuttons vii. **Communication Ports:** **Rear:** 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front:** 1 x Serial Port viii. **Communications Protocol:** Should have the following protocols: DNP 3.00 Level 2 Slave, ix. **Differential Communications:** 1300 nm Fiber x. **Digital Optoisolated Inputs:** Minimum of 16 – 110 Vac/Vdc digital inputs with an pickup 88–132 Vdc; Dropout	

ITEM	DESCRIPTION	Brand Name
	66 Vdc (External wetting); Inputs should be individually user-configured to operate. xi. **High Speed, High current Interuption (Outputs):** Minimum of 15 Universal outputs with the following criteria: Make: 30 A; Carry: 6 A continuous carry; MOV Protection: 270 Vac/360 Vdc; 40 J; xii. **Arc Flash capability:** No xiii. **Mounting:** Vertical Panel mount/ Horizontal Panel mount (Site specific) xiv. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xv. **Relay Logic/Automation:** Relay should have local control logic points; remote control logic points; latching logic points; counters; math variables; logic variables; timers xvi. **Monitoring and reporting:** Event Reporting and Sequential Events Recorder (SER) xvii. **Protection elements:** Relay should have the following protection elements: Current Differential Protection, Distance Protection, Overcurrent Fault Protection, Bus Stub Protection, Auto-Reclosing Control, Voltage Elements, Frequency, Fault Locator.	
25.	**Pilot Wire Differential Protection Relay. 1A** i. High transient stability ii. High speed operation iii. Low phase and earth fault settings iv. Little or no variation of settings with pilot length v. In zone bleed off up to 20% of rated load vi. 15kV pilot isolation option vii. Be connected as either Solkor Rf or SolkorR viii. **Rated Frequency: 50Hz/60Hz** ix. **Operating Frequency range:**47Hz to 52Hz x. **Max. Loop resistance:** **For R Mode:** 1000 ohm **For Rf Mode:** 2000 ohm xi. Peak Voltage applied to pilots under fault conditions: **For R Mode:** 300v **For RF Mode:** 450v xii. Maximum current carried by pilots under fault conditions: **For R Mode:** 200mA **For Rf Mode:** 250mA **NB! It is critical that it be noted that the existing Pilot Wire Protection relays are the Solkor R/RF make. The relays on Offer must be compatible with them**	
26.	**Pilot Wire Differential Protection Relay. 5A**	

ITEM	DESCRIPTION	Brand Name
	xiii. High transient stability xiv. High speed operation xv. Low phase and earth fault settings xvi. Little or no variation of settings with pilot length xvii. In zone bleed off up to 20% of rated load xviii. 15kV pilot isolation option xix. Be connected as either Solkor Rf or SolkorR xx. **Rated Frequency: 50Hz/60Hz** xxi. **Operating Frequency range:**47Hz to 52Hz xxii. **Max. Loop resistance:** **For R Mode:** 1000 ohm **For Rf Mode:** 2000 ohm xxiii. Peak Voltage applied to pilots under fault conditions: **For R Mode:** 300v **For RF Mode:** 450v xxiv. Maximum current carried by pilots under fault conditions: **For R Mode:** 200mA **For Rf Mode:** 250mA **NB! It is critical that it be noted that the existing Pilot Wire Protection relays are the Solkor R/RF make. The relays on Offer must be compatible with them**	
27.	Number of copies for instruction manual issued with the relay on delivery	
28.	**Master Station (Without I/O cards).** i. **Power Supply:** 20-60 VDC, 3 W typical ii. **Communication Ports:** Maintenance Port (RS-232/9600), minimum 2 x 10/100 base-T ethernet ports, minimum 4 x RS 232 ports. iii. **Communications Protocol:** DNP3 Serial, DNP3 LAN/WAN iv. **Mounting:** 19-inch rack mount v. **Time Synchronization:** Input via IRIG-B Input (Female BNC) or NTP Client, Output via IRIG-B OUTput (Female BNC) or NTP Server. vi. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). vii. **Warranty:** Minimum of Ten Year (10) warranty, for repair(s) or replacement(s).	
29.	**Master Station (With I/O cards).** i. **Power Supply:** 20-60 VDC, 3 W typical ii. **Communication Ports:** Maintenance Port (RS-232/9600), minimum 2 x 10/100 base-T ethernet ports, minimum 4 x RS 232 ports.	

ITEM	DESCRIPTION	Brand Name
	iii. **Communications Protocol:** DNP3 Serial, DNP3 LAN/WAN, SEL iv. Fast Messaging v. **Mounting:** 19-inch rack mount vi. **Time Synchronization:** Input via IRIG-B Input (Female BNC) or NTP Client, Output via IRIG-B OUTput (Female BNC) or NTP Server vii. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). viii. **Warranty:** Minimum of Ten Year (10) warranty, for re-pair(s) or replacement(s). **DIGITAL INPUTS** i. **Digital Inputs:** Bipolar inputs. Amount is project specific (Software debouncing, Chatter filtering, Report limiting) ii. **Current Burden:** ±3 to ±6 mA per input iii. **Scan Rate:** 1.0 ms iv. **Debounce:** Selectable 0 to 255 ms v. **SOE Time Resolution:** 1.0 ms vi. **Contact Wetting:** ±12, ±24, ±48, ±125 V (depending on application) vii. **Overload Rating:** 500 VDC (common mode to ground) **DIGITAL OUTPUTS** i. **Digital Outputs:** Open collector drivers for relays. Amount is project specific. ii. **Output Types:** Momentary (fixed), Latching, Trip/Close (T/C), Raise/Lower (R/L), Pulse duration, Pulse train iii. **Coil Status Check:** Every 500 µs iv. **Contact Duration:** Programmable 1 to 215 ms in 1 ms intervals (protocol dependent) **ANALOG INPUTS** i. **Analog Inputs:** Differential inputs. Amount is project specific (±20 mA) ii. **Overall Accuracy:** ±0.1% (current) iii. **Resolution:** 14 bit plus sign iv. **Over voltage Rating:** 35 VDC	
30.	**Input Card.** i. **Power Supply:** 20-60 VDC, 3 W typical ii. **Digital Inputs:** 64 bipolar inputs. (Software debouncing, Chatter filtering, Report limiting) iii. **Current Burden:** ±3 to ±6 mA per input iv. **Scan Rate:** 1.0 ms v. **Debounce:** Selectable 0 to 255 ms vi. **SOE Time Resolution:** 1.0 ms	

ITEM	DESCRIPTION	Brand Name
	vii. **Contact Wetting:** ±12, ±24, ±48, ±125 V (depending on application) viii. **Overload Rating:** 500 VDC (common mode to ground) ix. **LED Indicators:** Common LEDs, for each input point, a RED LED to indicate the ON/OFF state of the point x. **Communication Ports:** Maintenance Port (RS-232/9600), minimum 1 x 10/100 base-T ethernet ports, minimum 1 x RS 232/485 ports. xi. **Communications Protocol:** Should have the following protocols: DNP3 level 2 minimum. xii. **Size:** 19-inch rack mount xiii. **Software:** Windows-based PC software for setting, At no additional costs (free issue with the relay). xiv. **Warranty:** Minimum of Ten Year (10) warranty, for repair(s) or replacement(s).	
31.	**Output Card.** i. **Power Supply:** 20-60 VDC, 4 W typical at 24 V, 11 W max. at 24 V with all relays energized ii. **Digital Outputs:** 32 open collector drivers for relays. iii. **Output Types:** Momentary (fixed), Latching, Trip/Close (T/C), Raise/Lower (R/L), Pulse duration, Pulse train iv. **Coil Status Check:** Every 500 µs v. **Contact Duration:** Programmable 1 to 215 ms in 1 ms intervals (protocol dependent) vi. **LED Indicators:** Control points (RED), which turn on when the particular control point is enabled vii. **Communication Ports:** Maintenance Port (RS-232/9600), minimum 1 x 10/100 base-T ethernet ports, minimum 1 x RS 232/485 ports. viii. **Communications Protocol:** Should have the following protocols: DNP3 level 2 minimum ix. **Size:** 19-inch rack mount x. **Software:** Windows-based PC software for setting, At no additional costs (free issue with the relay). xi. **Warranty:** Minimum of Ten Year (10) warranty, for repair(s) or replacement(s).	
32.	**Analog Card.** i. **Power Supply:** 20-60 VDC, 7 W typical ii. **Analog Inputs:** 32 differential inputs. (±20 mA) iii. **Overall Accuracy:** ±0.1% (current) iv. **Resolution:** 14 bit plus sign v. **Over voltage Rating:** 35 VDC vi. **LED Indicators:** RED binary point LEDs, indicating the analog point that is currently being read	

ITEM	DESCRIPTION	Brand Name
	vii. **Communication Ports:** Maintenance Port (RS-232/9600), minimum 1 x 10/100 base-T Ethernet ports, minimum 1 x RS 232/485 ports. viii. **Communications Protocol:** Should have the following protocols: DNP3 level 2 minimum ix. **Size:** 19-inch rack mount x. **Software:** Windows-based PC software for setting, At no additional costs (free issue with the relay). xi. **Warranty:** Minimum of Ten Year (10) warranty, for repair(s) or replacement(s).	
33.	**Combo Card.** i. **Power Supply:** 20-60 VDC, 3 W typical ii. Yes: The card must have these capabilities: iii. **Over voltage Rating**: 35 VDC iv. **LED Indicators**: RED binary point LEDs, indicating the analog point that is currently being read v. **Communication Ports**: Maintenance Port (RS-232/9600), minimum 1 x 10/100 base-T Ethernet ports, minimum 1 x RS 232/485 ports. vi. **Communications Protocol**: Should have the following protocols: DNP3 level 2 minimum vii. **Size**: 19-inch rack mount viii. **Software**: Windows-based PC software for setting, At no additional costs (free issue with the relay). ix. **Warranty:** Minimum of Ten Year (10) warranty, for repair(s) or replacement(s). **DIGITAL INPUTS** i. **Digital Inputs:** 16 bipolar inputs. (Software debouncing, Chatter filtering, Report limiting) ii. **Current Burden:** ±3 to ±6 mA per input iii. **Scan Rate:** 1.0 ms iv. **Debounce:** Selectable 0 to 255 ms v. **SOE Time Resolution:** 1.0 ms vi. **Contact Wetting:** ±12, ±24, ±48, ±125 V (depending on application) vii. **Overload Rating:** 500 VDC (common mode to ground) **DIGITAL OUTPUTS** i. **Digital Outputs:** 16 open collector drivers for relays. ii. **Output Types:** Momentary (fixed), Latching, Trip/Close (T/C), Raise/Lower (R/L), Pulse duration, Pulse train iii. **Coil Status Check:** Every 500 µs iv. **Contact Duration:** Programmable 1 to 215 ms in 1 ms intervals (protocol dependent)	

ITEM	DESCRIPTION	Brand Name
	ANALOG INPUTS i. **Analog Inputs:** 16 differential inputs. (±20 mA) ii. **Overall Accuracy:** ±0.1% (current) iii. **Resolution:** 14 bit plus sign iv. **Over voltage Rating:** 35 VDC	

Table 44: Relays on existing equipment.

1. SPECIAL CONDITIONS

1.1 The successful bidder will be expected to enter into a Service Level Agreement with CENTLEC

1.2 Please note that CENTLEC reserves the right to appoint more than one bidder or none.

1.3 Factory Acceptance Test for CENTLEC personnel must be arrange at least a week before time so that proper arrangements can be made. Please complete 9.27 table 71 in the pricing schedule.

1.4 All the equipment delivered must be accompanied with protection wiring diagrams, panel layout drawings, factory test results, special keys, 200ml touch up paint, and maintenance manuals.

1.5 All the current transformer information will be indicated in the panel kiosk.

1.6 All the 32Volt DC panels must be labelled according to the specification, A1 to A10 and 22A1 to 22A10 in the middle and on top of the panel kiosk. Panels feeder name plates must be labelled in the front, back and on the circuit breaker itself. The 110 Volt DC panels as specify will be done the same way.

1.7 The successful services provider will train CENTLEC personnel on all relays, circuit breaker and panel operations for the duration of this contract. Arrangements will be made in time for personnel to be trained.

1.8 The service provider will submit, with his tender a fully breakdown for the spares that will be applicable to the new switchgears tendered for on Schedule 9.24.

1.9 The service provider must ensure that all circuit breakers are functional in all panels so that it can be utilized in any panel. CB wiring and panel wiring must be standard.

1.10 All guarantees and or warranties, for repair(s) or replacement(s) supplied from the manufacturer of the relays to the manufacturer of the panels must be conceded to CENTLEC.

2. HEALTH AND SAFETY REQUIREMENTS

7.1 The equipment must be plastic wrapped and secure when transport. All damage will be the responsibility of the service provider until equipment are off loaded on CENTLEC premises.

7.2 All the Items must be properly labelled with sticker, after wrapping, to identify the offloading without unwrapping the plastic rapping.

7.3 The offloading of equipment on CENTLEC premises must be done safely.

7.4 All chemical data sheets must be delivered with equipment.
7.5 Maintenance manuals must be delivered with equipment.

3. EVALUATION CRITERIA

All proposals submitted will be evaluated in accordance with the criteria set out in the policy of Supply Chain Management of the Entity.
The most suitable candidate will then be selected. Please take note that CENTLEC is not bound to select any of the bidders' submitting proposals.
Furthermore, technical competence is the principal selection criteria, CENTLEC will evaluate the technical criteria first, and will only look at the price and specified goals if it is satisfied with the technical evaluation. As a result of this, CENTLEC does not bind itself in any way to select the bidder offering the lowest price.

8.1 The relative evaluation criteria are as follows:

No.	Criteria	Description	Points
8.1.1	Track record and experience	Submit reference letter(s), signed off by an authorized official to confirm the successful completion of manufacturing, supplying, and delivering of similar equipment. Two (2) letters = **10 points** Three (3) or more letters = **20 points**.	20
8.1.2	Capability	The bidder(s) must provide proof of their ability to manufacture this equipment by submitting proof of the following: Manufacturing and test facility must be compliant to IEC 62271-100 = **30 Points**	30
8.1.3	Technical schedules	Did the Manufacturer complete all the Schedules and submit it? **Spare lists, in the pricing schedules must be completed in full = 30 Points**	30
8.1.4	Guarantee and/or Warranty	Submit Ten Year (10) warranty and/or guarantee that is signed by the manufacturer of the relays **= 10 points**	10
8.1.5	Local (Mangaung) operational capability and economic investment	Does the bidder have a local office with operational capability? (a) Existing and established local office = **10 points** (b) If not, but within RSA = **5 points**	10
		TOTAL	**100**

Table 44: Evaluation criteria

A bidder who gets a minimum of 85 points and above will qualify to the next stage. Individual tenders would have to be evaluated according to the preferential point system.

The bidder must score minimum points as follows:
Item 1 – 10 points
Item 2 – 30 points
Item 3 – 30 points
Item 4 – 10 points
Item 5 – 5 points in the Evaluation Criteria.

8.2 PRICE AND REFERENTIAL POINTS SCORING – STAGE 2 (Price and Specified Goals)

All Bidders that have passed the technical evaluation threshold of 85 points would also be scored based the 90/10 principle where 90 Points is for the Price and 10 points for Specified Goals as per the detail given below.

8.3 Points awarded for price.

A maximum of 90 Points is allocated for price on the following basis:

Where $Ps = 90[1 - \frac{\text{Pt} - \text{P min}}{\text{P min}}]$

Ps = Points Scored for comparative price of bid under consideration
Pt = Comparative Price of bid under consideration
P min = Comparative Price of lowest acceptable bid

8.4 Points awarded for Specific Goals Requirement

In terms of Regulation 3.(1) An organ of state must, in the tender documents, stipulate— (a) the applicable preference point system as envisaged in regulations 4, 5, 6 or 7; (b) the specific goal in the invitation to submit the tender for which a point may be awarded, and the number of points that will be awarded to each goal, and proof of the claim for such goals in accordance with the table below;

8.5 Table 3: Specified Goals for Preferential Point System

Specified Goals	Points Allocation
50% Black owned	5
50% Women owned	3
50% Youth owned <35 years	2
Total Points	10

Table 45: Specified Goals for Preferential Point System.

4. PRICING SCHEDULES

9.1 Quotation Price

9.1.1 The bid price(s) shall be SEIFSA based priced.

9.1.2 The bid price(s) shall be subject to a negotiated increase, if unavoidable, should the contract be extended for one or more further periods, each period not exceeding 12 months.

9.2 PRICE SCHEDULE FOR SPARES, Current transformers on special order. Prices must exclude VAT and include delivery to our CENTLEC stores.

Item	Description	Unit of measurement	Manufacturer Brand Name and type	Price in (R)	Delivery Time
9.2.1	100-50/5, 10 VA, Class 0.5 IL12/28/75 kV	**Each**			
9.2.2	100-50/10VA, 10P10 IL12/28/75 kV	**Each**			
9.2.3	Combined CT, 100-50/5, 10 VA Class 0.5, IL12/28/75 kV 100-50/5, 10VA, 10P10 IL12/28/75 kV	**Each**			
9.2.4	Combined CT 100-50/5, 10 VA Class 0.5, IL12/28/75 kV 600/1, 10VA, 10P10 IL12/28/75 kV	**Each**			
9.2.5	300-200-100/5, 10VA, Class 0.5 IL12/28/75 kV 600/1, 10VA, 10P10 IL12/28/75 kV	**Each**			
9.2.6	60/30/5, 10VA, 10P10, Ring type	**Each**			

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	IL12/28/75 kV				
9.2.7	600/5, 10VA, 10P10, Ring Type IL12/28/75 kV	**Each**			
9.2.8	60-30/5, 10 VA, Class 0.5, IL12/28/75 kV	**Each**			
9.2.9	100-50/5, 10 VA, Class 0.5, IL12/28/75 kV	**Each**			
9.2.10	200/100/60/1, 10VA, 10P10, Ring type	**Each**			
9.2.11	100/60/1, 10VA, 10P10, Ring type	**Each**			

Table 46: Schedule for Spares for Current Transformers.

9.3 NOTE: PRICES OF SPARES, for existing infrastructure, on the SBV3, SBV4, GEC, J&P and English Electrical Switch gear. Please include a circuit breaker list for spares. Prices must exclude VAT and include delivery to our CENTLEC stores.

Item	Description	Unit of Measure-ment	Manufacturer Brand Name and type	Unit Price in (R)	Delivery Time
9.3.1	32 Volt trip coil 32 Volt Closing coil	Each Each			
9.3.2	110 Volt trip coil	Each			
9.3.3	110 Volt Closing coil	Each			
9.3.4	110 Volt DC Spring charges motor	Each			
9.3.5	Circuit Breaker Contacts 400 Amp	Set of Three			
9.3.6	Circuit Breaker Contacts 800 Amp	Set of Three			
9.3.7	Circuit Breaker contacts 1600 Amp	Set of Three			

Item	Description	Unit of Measure-ment	Manufacturer Brand Name and type	Unit Price in (R)	Delivery Time
9.3.8	Circuit Breaker contacts 2000 Amp	Set of Three			
9.3.9	Vacuum Bottle replacement per set 400 Amp	Set of Three			
9.3.10	Vacuum Bottle replacement per set 1600 Amp	Set of Three			
9.3.11	Vacuum Bottle replacement per set 2000 Amp	Set of Three			
9.3.12	SF6 gas gauges for refilling of Sf6 gas	Set of Three			
9.3.13	Auxiliary contacts rotor switch for 110 Volt breaker	Each			
9.3.14	Auxiliary contacts rotor switch for 32 Volt breaker	Each			
9.3.15	Set of limit switches per circuit breaker	Per/set			
9.3.16	Touch-up paint 1 litre tin for panels	500ml			
9.3.17	400Amp Copper Busbars silver plated per/set of 3 with all Bolts & nuts	Set of Three			
9.3.18	Set of Three (3) 400 Amp Cable side spouts (Mono blocks)	Set of Three			
9.3.19	Set of Three (3) 400amp Busbar side spouts (Mono blocks)	Set of Three			
9.3.20	Set of Three (3) 800 Amp Cable side spouts (Mono blocks)	Set of Three			
9.3.21	Set of Three (3) 800amp Busbar side spouts (Mono blocks)	Set of Three			
9.3.22	Set of Three (3) 2000amp Busbar side spouts (Mono blocks)	Set of Three			
9.3.23	Set of Three (3) 2000 Amp Cable side spouts (Mono blocks)	Set of Three			
9.3.24	LED type lamp indicator Red, Yellow, Clear and green.	Set of Three			

Item	Description	Unit of Measure-ment	Manufacturer Brand Name and type	Unit Price in (R)	Delivery Time
9.3.25	12 kV Surge arresters x Three (3)	Set of Three			
9.3.26	Voltage Transformer, 11000/110 V, 100VA, 3 limb, Voltage factor 1.9, accuracy class 0.5. Complete with base.	Each			
9.3.27	Set of Three (3) Voltage transformer, Cu busbar raisers on the cable side.	Set of Three			
9.3.28	Set of Three (3) Voltage transformer, Cu busbar raisers on the busbar side.	Set of Three			
9.3.29	Current transformers 600/1,5P20, 10VA, IL 12/28/75 kV.	Each			
9.3.30	Current transformers 600/1, class X, IL 12/28/75 kV.	Each			
9.3.31	Current transformers 300/200/100/5, class 0.5, IL 12/28/75 kV.	Each			
9.3.32	Current transformers 60/30/5, class 0.5, IL 12/28/75 kV.	Each			
9.3.33	Dual Current Transformers 600/1,10P10, 10VA, IL 12/28/75 kV. Current transformers 300/200/100/5, class 0.5, IL 12/28/75 kV.	Each			
9.3.34	Dual Current Transformers 600/1,10P10, 10VA, IL 12/28/75 kV. Current transformers 60/30/5, class 0.5, IL 12/28/75 kV.	Each			

Item	Description	Unit of Measure-ment	Manufacturer Brand Name and type	Unit Price in (R)	Delivery Time
9.3.35	Plug sock for pendant control on panels, price per each.	Each			
9.3.36	All weather door for ring main K-3 type unit three cable entries.	Each			
9.3.37	Safety side wall for panels (Fire wall)	Each			
9.3.38	Hand-held remote control	Each			
9.3.39	J-packs for SBV3 2000Amp	Each			
9.3.40	J-packs for SBV3-E 2000Amp	Each			
9.3.41	J-packs for AG16 GEC Panel 800Amp	Each			
9.3.42	Nulec Battery charger 24VDC	Each			
9.3.43	Sf6 gas refill kit Nulec. Connecting fittings, pipes and gauges. Complete set.	Each			
9.3.44	GEC AG16 tank rubber packings	Each			
9.3.45	GEC AG16 inside tank insulation	Each			
9.3.46	230V AC panel heaters	Each			
9.3.47	Spring charges motors SBV4 & SBV3E	Each			
9.3.48	Spring charges motors LMR,LMT& LMS	Each			
9.3.49	110 VDC Trip coils for SBV 3	Each			
9.3.50	32 VDC trip coils for SBV4	Each			
9.3.51	32VDC Trip Coils for LMR, LMT & LMS	Each			

Table 47: Schedule for Spares

9.4 PRICE SCHEDULE FOR SPARES, for existing infrastructure, 30VDC RELAYS: (Ad-hoc purchase) Prices must exclude VAT and include delivery to our CENTLEC stores.

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
9.4.1	**Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT)** xi. **Power Supply:** Universal – 24 to 120V DC/AC. xii. **Secondary Input Current:**3 x AC 5A/1A plus a 1A/5A Neutral Input. xiii. **Voltage Input**: 110V phase to phase AC Voltage. xiv. **Configurable labels**: Yes, optional other type of labelling acceptable. xv. **Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: 1 x Serial Port xvi. **Communications Protocol**: DNP3_level 2 minimum xvii. **Digital opto- isolated Inputs**: Minimum of 8. Universal – 24 to 120V DC/AC voltage application (External wetting); Inputs should be individually user-configured to operate. xviii. **Digital opto-isolated high speed and high current Outputs**: Minimum of 6A continuous – Minimum of 5. Universal – 24 to 120V DC/AC voltage application. xix. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. xiii. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xx. **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
9.4.2	Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state				
9.4.3	3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state				
9.4.4	Transformer Over Temperature tripping relay Hand reset Flag or LEDs				
9.4.5	Arc Flash Sensors				
9.4.6	Number of copies for instruction manual issued with the relay on delivery				
9.4.7	**Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT), Sensitive Earth Fault and Auto Reclosing.** xii. **Power Supply:** Universal – 24 to 48VDC xiii. **Secondary Input Current:**3 x AC 1A plus a 50mA Neutral Input. xiv. **Voltage Input**: $V_{NOM\ (L\text{-}L)}$ should have the following specifications: 20 to 440V for DELTA_Y for DELTA and WYE xv. **Configurable labels**: Yes xvi. **Programmable pushbuttons**: Minimum of four programable pushbuttons, each with programable LEDs vii. **Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: 1 x Serial Port viii. **Communications Protocol**: DNP3 level 2 minimum. xix. **Digital Optoisolated Inputs**: Minimum of 8. Universal – 24VDC (External wetting); Inputs should be individually user-configured to operate. xx. **High Speed, High current Interuption (Outputs)**: Minimum of 6A continuous current – Minimum of 8 Universal – 19.2 to 60 VDC for the 24 to 48 power supply.				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xxi. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. xii. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay).				
9.4.8	Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state				
9.4.9	3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state				
9.4.10	50mA neutral SEF Element Relay 30VDC. (Only the card alone)				
9.4.11	1Amp OC/EF Element for the Relay, 30V DC. (Only the card alone)				
9.4.12	Transformer Over Temperature tripping relay Hand reset Flag or LEDs				
9.4.13	**Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT), Sensitive Earth Fault and Auto Reclosing.** xii. **Power Supply:** Universal – 110 to 120 VDC xiii. **Secondary Input Current:**3 x AC 1A plus a 50mA Neutral Input. xiv. **Voltage Input**: $V_{NOM\ (L\text{-}L)}$ should have the following specifications: 20 to 440V for DELTA_Y for DELTA and WYE xv. **Configurable labels**: Yes xvi. **Programmable pushbuttons**: Minimum of four programable pushbuttons, each with programable LEDs vii. **Communication Ports:** **Rear**: 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front**: 1 x Serial Port viii. **Communications Protocol**: DNP3 level 2 minimum.				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xix. **Digital Optoisolated Inputs**: Minimum of 8. Universal – 110V DC (External wetting); Inputs should be individually user-configured to operate. xx. **High Speed, High current Interruption (Outputs)**: Minimum of 6A continuous current – Minimum of 8 Universal – 110V DC for the 110V DC power supply. xxi. **Arc Flash capability**: 4 x Arc Flash detection inputs. Four Fiber-optic point sensors for ARC flash must be provided with the relay. xii. **Software**: Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). **Relay dimensions**: Must be able to fit onto the control panel portion of the switchgear.				
9.4.14	Sensitive Earth Fault – Time delay range 0.01-25 sec – solid state				
9.4.15	3Pole Multi Shot Auto-Reclose Relay – min. 4 Shot Programmable with counter-solid state				
9.4.16	Transformer Over Temperature tripping relay Hand reset Flag or LEDs				
9.4.17	Number of copies for instruction manual issued with the relay on delivery				
9.4.18	**Overcurrent and Earth fault- 3 Pole Phase plus Earth Fault (IDMT), Sensitive Earth Fault and Auto Reclosing with a minimum of 8 pushbuttons.** xvii. **Power Supply:** Universal – 125Vdc or 120 Vac xviii. **Secondary Input Current:** 1 Amp Phase, 1 Amp Neutral; 5Amp Phase, 5Amp Phase;1Amp Phase, 0.05Amp Neutral (nondirectional Sensitive Earth fault [SEF]). xix. **Voltage Input:** No xx. **Configurable labels:** Yes				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xxi. **Pushbuttons:** Minimum of eight operator control push buttons; Trip/Close Pushbuttons xxii. **Front panel LEDs:** Status and Trip Target LEDs **xiii. Communication Ports:** **Rear:** 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front:** 1 x Serial Port; EIA-485 xxiv. **Firmware:** Includes Mirrored Bits and Load Profile. xxv. **Communications Protocol:** Should have the following protocols: DNP 3.00 Level 2 Slave, standard protocols; IEC 61850 xvi. **Digital Optoisolated Inputs:** Minimum of 16 – 110 Vac/Vdc digital inputs with an pickup 88–132 Vdc; Dropout 66 Vdc (External wetting); Inputs should be individually user-configured to operate. xvii. **High Speed, High current Interuption (Outputs):** Minimum of 15 Universal outputs with the following criteria: Make: 30 A; Carry: 6 A continuous carry; MOV Protection: 270 Vac/360 Vdc; 40 J; xviii. **Arc Flash capability**: No xxix. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xxx. **Protection elements:** Phase Fault Overcurrent Protection; Adaptive Phase Overcurrent Elements; Ground Fault Overcurrent Protection; Directional Ground Protection; Under- and Overvoltage Elements; Under- and Over frequency Protection; Rate-of-Change-of-Frequency Protection; Harmonic Blocking; Sequence Voltage Elements; Fault Locator xxxi. **Relay Logic/Automation:** Relay should have: local control logic points; remote control logic points; latching logic points; counters; math variables; logic variables; timers				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xxii. **Monitoring and reporting:** Event Reporting and Sequential Events Recorder (SER)				
9.4.19	Number of copies for instruction manual issued with the relay on delivery				
9.4.20	**Busbar Protection Relay that may have additional Protection capabilities.** xviii. **Power Supply:** Universal – 48/125 Vdc or 110-120 Vac xix. **Mainboard Input Voltage:** 110 Vdc xx. **Secondary Input Current:** 1 Amp Phase, 1 Amp Neutral. xxi. **Voltage Input:** 3 AC Voltage, 21 AC Current xxii. **Configurable labels:** Yes xxiii. **Programmable pushbuttons:** Trip/Close Pushbuttons; 8 operator control pushbuttons xxiv. **Front panel LEDs:** Status and Trip Target LEDs (minimum of 16) xxv. **Communication Ports:** **Rear:** Ethernet Card with Two 10/100 base-T plus 1 x 1 RS 232 port **Front:** 1 x Serial Port; EIA-485 xxvi. **Firmware:** Includes Mirrored Bits and Load Profile. xxvii. **Communications Protocol:** Should have the following protocols: DNP 3.00 Level 2 Slave, FTP, Telnet, and DNP3 LAN/WAN xxviii. **Digital Optoisolated Inputs:** Minimum of 16 – 110 Vac/Vdc digital inputs with an pickup 88–132 Vdc; Dropout 66 Vdc (External wetting); Inputs should be individually user-configured to operate. xxix. **High Speed, High current Interuption (Outputs):** Minimum of 15 Universal outputs with the following criteria: Make: 30 A; Carry: 6 A continuous carry; MOV Protection: 270 Vac/360 Vdc; 40 J;				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xxx. **Arc Flash capability:** No xxxi. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xxii. **Protection elements:** Phase Fault Overcurrent Protection; Adaptive Phase Overcurrent Elements; Ground Fault Overcurrent Protection; Directional Ground Protection; Under- and Overvoltage Elements; Under- and Over frequency Protection; Rate-of-Change-of-Frequency Protection; Harmonic Blocking; Sequence Voltage Elements; Fault Locator xxiii. **Relay Logic/Automation: Relay should have:** local control logic points; remote control logic points; 2 latching logic points; counters; math variables; logic variables; timers xxiv. **Monitoring and reporting**: Event Reporting and Sequential Events Recorder (SER)				
9.4.21	Number of copies for instruction manual issued with the relay on delivery				
9.4.22	**Transformer Differential Protection Relay that may have additional Protection capabilities.** xv. **Power Supply:** Universal – 125/250 Vdc or Vac; 85–350 Vdc or 85–264 Vac xvi. **AC Secondary Input Current:** Secondary Input Current 1 Amp Phase, 1 Amp Neutral, including 2xREF Element; 3 A continuous, 100 A for 1 s; xvii. **Voltage Input:** No xviii. **Configurable labels:** No xix. **Front panel LEDs:** Status and Trip Target LEDs xx. **Programmable pushbuttons:** Minimum of eight operator control pushbuttons xxi. **Communication Ports:** **Rear:** 1 x 10/100 base-T plus 1 x 1 RS 232 port.				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	Front: 1 x Serial Port xxii. **Communications Protocol:** Should have the following protocols: DNP 3.00 Level 2 Slave, xxiii. **Digital Optoisolated Inputs:** Minimum of 16 – 110 Vac/Vdc digital inputs with an pickup 88–132 Vdc; Dropout 66 Vdc (External wetting); Inputs should be individually user-configured to operate. xxiv. **High Speed, High current Interruption (Outputs):** Minimum of 15 Universal outputs with the following criteria: Make: 30 A; Carry: 6 A continuous carry; MOV Protection: 270 Vac/360 Vdc; 40 J; xxv. **Arc Flash capability:** No xxvi. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xvii. **Relay Logic/Automation:** Relay should have local control logic points; remote control logic points; latching logic points; counters; math variables; logic variables; timers xviii. **Monitoring and reporting:** Event Reporting and Sequential Events Recorder (SER) **Protection elements:** Relay should have the following protection elements: Percentage Differential Protection; Harmonic and DC Elements; Unrestrained Differential Protection; Overcurrent Fault Protection; Restricted Earth Fault Protection; Through-Fault Event Monitor; CT Phase Angle Compensation				
9.4.23	Number of copies for instruction manual issued with the relay on delivery				
9.4.24	**Line Differential Protection Relay that may have additional Protection capabilities.** xviii. **Power Supply:** Universal – 48/125 Vdc or 125 Vac; Range: 85–350 Vdc or 85–264 Vac				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xix. **AC Secondary Input Current:** Secondary Input Current 1 Amp Phase, 1 Amp Neutral; Input Current 5 Amp Phase, 5 Amp Neutral, xx. **Voltage Input:** Wye-Connected Va, Vb and Vc (150 Va Maximum Phase-Neutral; channel Vs also rated to 150 Vac) xxi. **Configurable labels:** No xxii. **Front panel LEDs:** Status and Trip Target LEDs xxiii. **Programmable pushbuttons:** Minimum of eight operator control pushbuttons xxiv. **Communication Ports:** **Rear:** 1 x 10/100 base-T plus 1 x 1 RS 232 port. **Front:** 1 x Serial Port xxv. **Communications Protocol:** Should have the following protocols: DNP 3.00 Level 2 Slave, xxvi. **Differential Communications:** 1300 nm Fiber xvii. **Digital Optoisolated Inputs:** Minimum of 16 – 110 Vac/Vdc digital inputs with an pickup 88–132 Vdc; Dropout 66 Vdc (External wetting); Inputs should be individually user-configured to operate. xviii. **High Speed, High current Interuption (Outputs):** Minimum of 15 Universal outputs with the following criteria: Make: 30 A; Carry: 6 A continuous carry; MOV Protection: 270 Vac/360 Vdc; 40 J; xxix. **Arc Flash capability:** No xxx. **Mounting:** Vertical Panel mount/ Horizontal Panel mount (Site specific) xxxi. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xxii. **Relay Logic/Automation:** Relay should have local control logic points; remote control logic points; latching logic points; counters; math variables; logic variables; timers				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xxiii. **Monitoring and reporting:** Event Reporting and Sequential Events Recorder (SER) xxiv. **Protection elements:** Relay should have the following protection elements: Current Differential Protection, Distance Protection, Overcurrent Fault Protection, Bus Stub Protection, Auto-Reclosing Control, Voltage Elements, Frequency, Fault Locator.				
9.4.25	**Pilot Wire Differential Protection Relay. 1A** xxv. High transient stability xxvi. High speed operation xvii. Low phase and earth fault settings xviii. Little or no variation of settings with pilot length xxix. In zone bleed off up to 20% of rated load xxx. 15kV pilot isolation option xxxi. Be connected as either Solkor Rf or SolkorR xxii. **Rated Frequency: 50Hz/60Hz** xxiii. **Operating Frequency range:**47Hz to 52Hz xxiv. **Max. Loop resistance:** **For R Mode:** 1000 ohm **For Rf Mode:** 2000 ohm xxv. Peak Voltage applied to pilots under fault conditions: **For R Mode:** 300v **For RF Mode:** 450v xxvi. Maximum current carried by pilots under fault conditions: **For R Mode:** 200mA **For Rf Mode:** 250mA **NB! It is critical that it be noted that the existing Pilot Wire Protection relays are the Solkor R/RF make. The relays on Offer must be compatible with them**				
9.4.26	**Pilot Wire Differential Protection Relay. 5A**				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xvii. High transient stability xviii. High speed operation xix. Low phase and earth fault settings xl. Little or no variation of settings with pilot length xli. In zone bleed off up to 20% of rated load xlii. 15kV pilot isolation option xliii. Be connected as either Solkor Rf or SolkorR xliv. **Rated Frequency: 50Hz/60Hz** xlv. **Operating Frequency range:**47Hz to 52Hz xlvi. **Max. Loop resistance:** **For R Mode:** 1000 ohm **For Rf Mode:** 2000 ohm xlvii. Peak Voltage applied to pilots under fault conditions: **For R Mode:** 300v **For RF Mode:** 450v lviii. Maximum current carried by pilots under fault conditions: **For R Mode:** 200mA **For Rf Mode:** 250mA **NB! It is critical that it be noted that the existing Pilot Wire Protection relays are the Solkor R/RF make. The relays on Offer must be compatible with them**				
9.4.27	Number of copies for instruction manual issued with the relay on delivery				
9.4.28	**Master Station (Without I/O cards).** viii. **Power Supply:** 20-60 VDC, 3 W typical ix. **Communication Ports:** Maintenance Port (RS-232/9600), minimum 2 x 10/100 base-T ethernet ports, minimum 4 x RS 232 ports. x. **Communications Protocol:** DNP3 Serial, DNP3 LAN/WAN				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xi. **Mounting:** 19-inch rack mount xii. **Time Synchronization:** Input via IRIG-B Input (Female BNC) or NTP Client, Output via IRIG-B OUTput (Female BNC) or NTP Server. xiii. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xiv. **Warranty:** Minimum of Ten Year (10) warranty, for repair(s) or replacement(s).				
9.4.29	**Master Station (With I/O cards).** ix. **Power Supply:** 20-60 VDC, 3 W typical x. **Communication Ports:** Maintenance Port (RS-232/9600), minimum 2 x 10/100 base-T ethernet ports, minimum 4 x RS 232 ports. xi. **Communications Protocol:** DNP3 Serial, DNP3 LAN/WAN, SEL xii. Fast Messaging xiii. **Mounting:** 19-inch rack mount xiv. **Time Synchronization:** Input via IRIG-B Input (Female BNC) or NTP Client, Output via IRIG-B OUTput (Female BNC) or NTP Server xv. **Software:** Windows-based PC software for setting, report retrieval, metering, HMI, and control; At no additional costs (free issue with the relay). xvi. **Warranty:** Minimum of Ten Year (10) warranty, for repair(s) or replacement(s). **DIGITAL INPUTS** viii. **Digital Inputs:** Bipolar inputs. Amount is project specific (Software debouncing, Chatter filtering, Report limiting) ix. **Current Burden:** ±3 to ±6 mA per input				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	x. **Scan Rate:** 1.0 ms xi. **Debounce:** Selectable 0 to 255 ms xii. **SOE Time Resolution:** 1.0 ms xiii. **Contact Wetting:** ±12, ±24, ±48, ±125 V (depending on application) xiv. **Overload Rating:** 500 VDC (common mode to ground) **DIGITAL OUTPUTS** v. **Digital Outputs:** Open collector drivers for relays. Amount is project specific. vi. **Output Types:** Momentary (fixed), Latching, Trip/Close (T/C), Raise/Lower (R/L), Pulse duration, Pulse train vii. **Coil Status Check:** Every 500 µs viii. **Contact Duration:** Programmable 1 to 215 ms in 1 ms intervals (protocol dependent) **ANALOG INPUTS** v. **Analog Inputs:** Differential inputs. Amount is project specific (±20 mA) vi. **Overall Accuracy:** ±0.1% (current) vii. **Resolution:** 14 bit plus sign viii. **Over voltage Rating:** 35 VDC				
9.4.30	**Input Card.** xv. **Power Supply:** 20-60 VDC, 3 W typical xvi. **Digital Inputs:** 64 bipolar inputs. (Software debouncing, Chatter filtering, Report limiting) xvii. **Current Burden:** ±3 to ±6 mA per input xviii. **Scan Rate:** 1.0 ms xix. **Debounce:** Selectable 0 to 255 ms xx. **SOE Time Resolution:** 1.0 ms				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xxi. **Contact Wetting:** ±12, ±24, ±48, ±125 V (depending on application) xxii. **Overload Rating:** 500 VDC (common mode to ground) xxiii. **LED Indicators:** Common LEDs, for each input point, a RED LED to indicate the ON/OFF state of the point xxiv. **Communication Ports:** Maintenance Port (RS-232/9600), minimum 1 x 10/100 base-T ethernet ports, minimum 1 x RS 232/485 ports. xxv. **Communications Protocol:** Should have the following protocols: DNP3 level 2 minimum. xxvi. **Size:** 19-inch rack mount xxvii. **Software:** Windows-based PC software for setting, At no additional costs (free issue with the relay). xxviii. **Warranty:** Minimum of Ten Year (10) warranty, for repair(s) or replacement(s).				
9.4.31	**Output Card.** xii. **Power Supply:** 20-60 VDC, 4 W typical at 24 V, 11 W max. at 24 V with all relays energized xiii. **Digital Outputs:** 32 open collector drivers for relays. xiv. **Output Types:** Momentary (fixed), Latching, Trip/Close (T/C), Raise/Lower (R/L), Pulse duration, Pulse train xv. **Coil Status Check:** Every 500 µs xvi. **Contact Duration:** Programmable 1 to 215 ms in 1 ms intervals (protocol dependent) xvii. **LED Indicators:** Control points (RED), which turn on when the particular control point is enabled xviii. **Communication Ports:** Maintenance Port (RS-232/9600), minimum 1 x 10/100 base-T ethernet ports, minimum 1 x RS 232/485 ports. xix. **Communications Protocol:** Should have the following protocols: DNP3 level 2 minimum				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xx. **Size:** 19-inch rack mount xxi. **Software:** Windows-based PC software for setting, At no additional costs (free issue with the relay). xxii. **Warranty:** Minimum of Ten Year (10) warranty, for repair(s) or replacement(s).				
9.4.32	**Analog Card.** xii. **Power Supply:** 20-60 VDC, 7 W typical xiii. **Analog Inputs:** 32 differential inputs. (±20 mA) xiv. **Overall Accuracy:** ±0.1% (current) xv. **Resolution:** 14 bit plus sign xvi. **Over voltage Rating:** 35 VDC xvii. **LED Indicators:** RED binary point LEDs, indicating the analog point that is currently being read xviii. **Communication Ports:** Maintenance Port (RS-232/9600), minimum 1 x 10/100 base-T Ethernet ports, minimum 1 x RS 232/485 ports. xix. **Communications Protocol:** Should have the following protocols: DNP3 level 2 minimum xx. **Size:** 19-inch rack mount xxi. **Software:** Windows-based PC software for setting, At no additional costs (free issue with the relay). xxii. **Warranty:** Minimum of Ten Year (10) warranty, for repair(s) or replacement(s).				
9.4.33	**Combo Card.** x. **Power Supply:** 20-60 VDC, 3 W typical xi. Yes: The card must have these capabilities: xii. **Over voltage Rating**: 35 VDC xiii. **LED Indicators**: RED binary point LEDs, indicating the analog point that is currently being read				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	xiv. **Communication Ports**: Maintenance Port (RS-232/9600), minimum 1 x 10/100 base-T Ethernet ports, minimum 1 x RS 232/485 ports. xv. **Communications Protocol**: Should have the following protocols: DNP3 level 2 minimum xvi. **Size**: 19-inch rack mount xvii. **Software**: Windows-based PC software for setting, At no additional costs (free issue with the relay). xviii. **Warranty:** Minimum of Ten Year (10) warranty, for repair(s) or replacement(s). **DIGITAL INPUTS** viii. **Digital Inputs:** 16 bipolar inputs. (Software debouncing, Chatter filtering, Report limiting) ix. **Current Burden:** ±3 to ±6 mA per input x. **Scan Rate:** 1.0 ms xi. **Debounce:** Selectable 0 to 255 ms xii. **SOE Time Resolution:** 1.0 ms xiii. **Contact Wetting:** ±12, ±24, ±48, ±125 V (depending on application) xiv. **Overload Rating:** 500 VDC (common mode to ground) **DIGITAL OUTPUTS** v. **Digital Outputs:** 16 open collector drivers for relays. vi. **Output Types:** Momentary (fixed), Latching, Trip/Close (T/C), Raise/Lower (R/L), Pulse duration, Pulse train vii. **Coil Status Check:** Every 500 µs viii. **Contact Duration:** Programmable 1 to 215 ms in 1 ms intervals (protocol dependent) **ANALOG INPUTS**				

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price in (R)	Delivery Time
	v. **Analog Inputs:** 16 differential inputs. (±20 mA) vi. **Overall Accuracy:** ±0.1% (current) vii. **Resolution:** 14 bit plus sign viii. **Over voltage Rating:** 35 VDC				

Table 48: Price Schedule For Spares, For Existing 30VDC Relays

9.5 PRICES AND DELIVERY SCHEDULE - Prices must exclude VAT and include delivery to our CENTLEC stores.

PART A – 12kV PRICING FOR METAL-CLAD SWITCHGEAR: (New A1 to A10)

Item	Schedule	Description	Unit of meas-ure-ment	Manufacturer Brand Name and type	Price per unit in (R)for Oil	Price per unit in (R)for vacuum	Delivery period in weeks
9.5.1	A1	Switch - Disconnector panel - dia-gram 1/10	Each				
9.5.2	A2	Circuit breaker panel - diagram 2/10 MV Connection < 1 MVA	Each				
9.5.3	A3	Circuit breaker panel - diagram 3/10 MV Connection > 1 MVA	Each				
9.5.4	A4	Circuit breaker panel - diagram 4/10 Secondary feeder	Each				
9.5.5	A5.	Circuit breaker panel - diagram 5/10 Primary feeder (out-going)	Each				
9.5.6	A6	Circuit breaker panel - diagram 6/10 Transformer feeder	Each				
9.5.7	A7	Circuit breaker panel - diagram 7/10 Overhead line feeder	Each				
9.5.8	A.8	Circuit breaker panel - diagram 8/10 Primary feeder - (in-coming)	Each				

Item	Schedule	Description	Unit of meas-ure-ment	Manufacturer Brand Name and type	Price per unit in (R)for Oil	Price per unit in (R)for vacuum	Delivery period in weeks
9.5.9	A.9	Circuit breaker panel - diagram 9/10 Bus- Section switch (busbar coupler)	Each				
9.5.10	A.10	Fused switch disconnector - diagram 10/10	Each				

Table 49: 12kV PRICING FOR METAL-CLAD SWITCHGEAR

PART A – 22kV PRICING FOR METAL-CLAD SWITCHGEAR. (New 22A1 to 22A10)

Item	Schedule	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price per unit in (R)for Oil	Price per unit in (R)for vacuum	Delivery period in weeks
9.5.11	22A1	Switch - Disconnector panel - diagram 1/10	Each				
9.5.12	22A2	Circuit breaker panel - diagram 2/10 MV Connection < 1 MVA	Each				
9.5.13	22A3	Circuit breaker panel - diagram 3/10 MV Connection > 1 MVA	Each				
9.5.14	22A4	Circuit breaker panel - diagram 4/10 Secondary feeder	Each				
9.5.15	22A5.	Circuit breaker panel - diagram 5/10 Primary feeder (out-going)	Each				
9.5.16	22A6	Circuit breaker panel - diagram 6/10 Transformer feeder	Each				
9.5.17	22A7	Circuit breaker panel - diagram 7/10 Overhead line feeder	Each				
9.5.18	22A.8	Circuit breaker panel - diagram 8/10 Primary feeder - (in-coming)	Each				

Item	Schedule	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price per unit in (R)for Oil	Price per unit in (R)for vacuum	Delivery period in weeks
9.5.19	22A.9	Circuit breaker panel - diagram 9/10 Bus- Section switch (busbar coupler)	Each				
9.5.20	22A.10	Fused switch disconnector - diagram 10/10	Each				

Table 50: 22kV Pricing For Metal-Clad Switchgear.

9.6 5.4.11 12kV PRICING FOR 110VDC PANELS: Tender must be for single and double busbars. (Upper bar and back bar) Complete with busbars. (Existing switchgear, SBV3 and SBV3 E)

Item	Sched-ule	Description	Unit	Manufacturer Brand Name and type	Price per unit in (R) for Sin-gle Bar	Price per unit in (R)for Front and Back Bar	Price per unit in (R)for Upper and Lower Bar	Delivery pe-riod weeks
9.6.1	5.4.11 A	Feeder panel	Each					
9.6.2	5.4.11 B	Incomer panel with 3Limb VT	Each					
9.6.3	5.4.11 B	Incomer panel with 5Limb VT	Each					
9.6.4	5.4.11.C	Bus Coupler panel	Each					
9.6.5	5.4.12. D	Voltage transformer 11000/110 V, 100VA, 5 limb, Voltage factor 1.9, accuracy class 0.5. Complete with base and busbar rais-ers.	Each					

Item	Sched-ule	Description	Unit	Manufacturer Brand Name and type	Price per unit in (R) for Sin-gle Bar	Price per unit in (R)for Front and Back Bar	Price per unit in (R)for Upper and Lower Bar	Delivery pe-riod weeks
9.6.6	5.4.13. E	Voltage transformer 11000/110 V, 100VA, 3 limb, Voltage factor 1.9, accuracy class 0.5. Complete with base and busbar rais-ers.	Each					

Table 51: 12kV PRICING FOR 110VDC PANELS.

9.7 PRICING FOR PACKS: 12kV

Item	Schedule	Description	Unit of meas-urement	Manufacturer Brand Name and type	Price per unit in (R)	Delivery pe-riod in weeks
9.7.1	A12.1	Panel packs "P"-packs (all tapes, bolts and nuts for panels included)	Each			
9.7.2	A12.2A	a) Jointing packs "J"-packs 400 Amp silver coated on the connection points. (Bolts and nuts included)	Each			
9.7.3	A12.2B	b) Jointing packs "J"-packs 800 Amp silver coated on the connection points. (Bolts and nuts included)	Each			
9.7.4	A12.2C	c) Jointing packs "J"-packs 2000 Amp silver coated on the connection points. (Bolts and nuts included)	Each			

Item	Schedule	Description	Unit of measurement	Manufacturer Brand Name and type	Price per unit in (R)	Delivery period in weeks
9.7.5	A12.3	Switchboard accessories "S"-packs, with wall mounted steel lockable cabinet.	Each			
9.7.6	A12.4	Test packs "T"-packs	Each			
9.7.7	A12.3	Hand-held remote control	Each			

Table 52: 12kV PRICING FOR PACKS:

9.8 PRICING FOR PACKS: 22kV (boxes must be marked clearly)

Item	Schedule	Description	Unit of measurement	Manufacturer Brand Name and type	Price per unit in (R)	Delivery period in weeks
9.8.1	22A12.1	Panel packs "P"-packs (all tapes, bolts and nuts for panels included)	Each			
9.8.2	22A12.2A	a) Jointing packs "J"-packs 400 Amp silver coated on the connection points. (Bolts and nuts included)	Each			
9.8.3	22A12.2B	b) Jointing packs "J"-packs 800 Amp silver coated on the connection points. (Bolts and nuts included)	Each			
9.8.4	22A12.2C	c) Jointing packs "J"-packs 2000 Amp silver coated on the connection points. (Bolts and nuts included)	Each			
9.8.5	22A12.3	Switchboard accessories "S"-packs, with wall mounted steel lockable cabinet.	Each			
9.8.6	22A12.4	Test packs "T"-packs	Each			

Item	Schedule	Description	Unit of measurement	Manufacturer Brand Name and type	Price per unit in (R)	Delivery period in weeks
9.8.7	22A12.3	Hand-held remote control	Each			

Table 53: PRICING FOR PACKS: 22kV

9.9 PART B – NON-EXTENSIBLE RING MAIN UNITS 12kV.

Item	Schedule	Description	Unit of measurement	Manufacturer Brand Name and type	Price per unit (R) for Oil	Price per unit (R) for SF6 Gas	Delivery period in weeks
9.9.1	B1	Ring main unit with fused transformer feeder without metering.	Each				
9.9.2	B2	Ring main unit with fused transformer feeder with metering unit, fitted inside metal clad outdoor kiosk	Each				
9.9.3	B3	Ring main unit with two fused transformer feeders- One with metering and the other one without metering for medium voltage connection.	Each				

Table 54: NON-EXTENSIBLE RING MAIN UNITS 12kV

9.10 PART B – NON-EXTENSIBLE RING MAIN UNITS 22kV.

Prices must exclude VAT and include delivery to our CENTLEC stores.

Item	Schedule	Description	Unit of measurement	Manufacturer Brand Name and type	Price per unit (R) for Oil	Price per unit (R) for SF6 Gas	Delivery period in weeks
9.10.1	B1	Ring main unit with fused transformer feeder without metering.	Each				
9.10.2	B2	Ring main unit with fused transformer feeder with metering unit, fitted inside metal clad outdoor kiosk	Each				

Item	Schedule	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price per unit (R) for Oil	Price per unit (R) for SF6 Gas	Delivery pe-riod in weeks
9.10.3	B3	Ring main unit with two fused trans-former feeders- One with metering and the other one without metering for medium voltage connection	Each				

Table 55: NON-EXTENSIBLE RING MAIN UNITS 22kV

9.11 A Supply and/or repairs of NULEC N-series ACR N12 and E-series ACR Pole mounted Automatic Circuit Reclosing Breakers (12kV).

Item	Description	Unit of meas-urement	Manufacturer Brand Name and type	Price per unit (R) for Oil	Price per unit (R) for SF6 Gas	Delivery period in weeks
9.11.1	**NULEC N-series ACR N12 Pole mounted Auto-matic Circuit Reclosing Breakers (12kV).**	Each				

Table 56: Pole mounted Automatic Circuit Reclosing Breakers (12kV).

9.12 A Supply and/or repairs of NULEC N-series ACR N12 and E-series ACR Pole mounted Automatic Circuit Reclosing Breakers (22kV).

Item	Description	Unit of measure-ment	Manufacturer Brand Name and type	Price per unit (R) for Oil	Price per unit (R) for SF6 Gas	Delivery pe-riod in weeks
9.12.1	NULEC N-series ACR N12 Pole mounted Automatic Circuit Reclos-ing Breakers (22kV).	**Each**				

Table 57: Pole mounted Automatic Circuit Reclosing Breakers (22kV).

9.13 B Magnefix / Interswitch Type MF disconnector switch 12kV

The Magnefix MF disconnector switches must be supplied complete with brackets and fuses to fit in a miniature substation HT kiosk.

Item	Description	Unit of measurement	Manufacturer Brand Name and type	Price per unit (R)	Delivery period in weeks
9.13.1	**Magnefix / Interswitch Type MF disconnector switch 12kV** The Magnefix MF disconnector switches must be supplied complete with brackets and fuses to fit in a miniature substation HT kiosk.	Each			

Table 58: Pole mounted Automatic Circuit Reclosing Breakers (12kV).

9.14 B Magnefix / Interswitch Type MF disconnector switch 22kV

The Magnefix MF disconnector switches must be supplied complete with brackets and fuses to fit in a miniature substation HT kiosk.

Item	Description	Unit of measurement	Manufacturer Brand Name and type	Price per unit (R)	Delivery period in weeks
9.14.1	**Magnefix / Interswitch Type MF disconnector switch 22kV** The Magnefix MF disconnector switches must be supplied complete with brackets and fuses to fit in a miniature substation HT kiosk.	**Each**			

Table 59: Pole mounted Automatic Circuit Reclosing Breakers (22kV).

9.15 PART C – 1. A. Oil to Vacuum Circuit Breakers Retrofit and Repair of The Listed Circuit Breakers, 12kV. Prices must exclude VAT and include delivery to our CENTLEC Premises.

Item	Schedule	Description	Unit	Manufacturer Brand Name and type	Unit total price in (R)	Delivery period in weeks
9.15.1	C1 a)	Vacuum circuit breaker to retrofit type PDB oil circuit breaker to fit the panel without any alternations to the panel. This must be for GEC, English-Electric and Johnson & Phillips. Type AG 16.12kV switchgear.	Each			
9.15.2	C1 b)	Transport of circuit breaker	p/km			
9.15.3	C1 c)	Labour	p/hour			

Item	Sched-ule	Description	Unit	Manufacturer Brand Name and type	Unit total price in (R)	Delivery period in weeks
9.15.4	C1 d)	Repair CB on existing switchgear list below.	Each		"Strip & Quote" will be applicable.	
9.15.5	C1 e)	Retrofit the Reyrolle breakers spring charge mechanism with new spring charges motors.	Each		Strip & Quote" will be applicable.	

Table 60: Oil to Vacuum Circuit Breakers Retrofit and Repair

9.16 B. Retrofit existing Switch Reyrolle LMS, LMR, LMT to VD4-LMT ABB-Reyrolle CB. (Vacuum for 110 and 32 VDC panels)

Replacement circuit breaker for LMS, LMR, LMT – 800 Amp and delivered at CENTLEC premises.

Item	DESCRIPTION OF PARTICU-LARS	UNITS	SPECIFIED RE-QUIREMENT	Unit	Price in (R)	Delivery period in weeks
9.16.1	Manufacturer			**Each**		
	Country of origin					
	Total switchgear mass	kg				
	Nominal voltage	kV	12			
	Rated voltage	kV	12			
	Circuit rated normal current	A	800			
	Busbar rated normal current	A	800			
	Fault breaking capacity	MVA	350			
	Fault making capacity	kA	31.5			
	Through fault rating for 3 seconds	kA	20 kA			
	Standard 1/50 microsecond im-pulse rating at sea level	kV	95			
	Spring charges		110VDC			
	Spring charges		32VDC			

Item	DESCRIPTION OF PARTICULARS	UNITS	SPECIFIED REQUIREMENT	Unit	Price in (R)	Delivery period in weeks
	Circuit Breaker to fit Panel		Circuit Breaker to fit in existing panel without alternations to panel.			

Table 60: Retrofit existing Switch Reyrolle LMS, LMR, LMT to VD4-LMT ABB-Reyrolle CB.

9.17 Replacement circuit breaker for LMS, LMR, LMT – 1250 Amp and delivered at CENTLEC premises. (Retrofit)

Item	DESCRIPTION OF PARTICULARS	UNITS	SPECIFIED REQUIREMENT	Unit	Price in (R)	Delivery period in weeks
9.17.1	Manufacturer Country of origin			**Each**		
	Total switchgear mass	kg				
	Nominal voltage	kV	12			
	Rated voltage	kV	12			
	Circuit rated normal current	A	1250			
	Busbar rated normal current	A	1250			
	Fault breaking capacity	MVA	350			
	Fault making capacity	kA	31.5			
	Through fault rating for 3 seconds	kA	20 kA			
	Standard 1/50 microsecond impulse rating at sea level	kV	95			
	Spring charges		110VDC			
	Spring charges		32VDC			
	Circuit Breaker to fit Panel		Circuit Breaker to fit in existing panel without alternations to panel.			

Table 61: Retrofit existing Switch Reyrolle LMS, LMR, LMT to VD4-LMT ABB-Reyrolle CB.

9.18 Replacement of a complete Reyrolle panel delivered to CENTLEC premises.

Item	DESCRIPTION OF PARTICULARS	SPECIFIED RE-QUIREMENT	UNITS	Manufacturer Brand Name and type	Price in (R)
9.18.1	Reyrolle **Panel** complete with busbars and shutters.	1250	**Each**		
9.18.2	Reyrolle **Panel** complete with busbars and shutters.	800	**Each**		

Table 62: Retrofit existing Switch Reyrolle LMS, LMR, LMT to VD4-LMT ABB-Reyrolle CB

9.19 Replacement Reyrolle Voltage Transformer delivered at CENTLEC premises. (complete)

	VOLTAGE TRANSFORMER (Cable side)				
Item	**DESCRIPTION OF PAR-TICULARS**	**SPECIFIED REQUIREMENT**	**UNITS**	**Manufacturer Brand Name and type**	**Unit total price in (R)**
9.19.1	Install VT	Yes	**Each**		
	Ratio	11000/110/63.5 Volts			
	Burden and Accuracy	100 VA Class 0.5			
	Voltage Factor	1.9			
	HT Fuses	3Amp			
	VT busbar risers	12kV insulated with 12mm hole.			
	VT Base plate	Yes			

Table 63: Reyrolle Voltage Transformer

9.20 Replacement Reyrolle Current Transformer delivered at CENTLEC premises. (complete)

	CURRENT TRANSFORMERS: Studded 6mm Brass "S" connections.					
Item	**DESCRIPTION OF PARTICULARS**	**SPECIFIED RE-QUIREMENT**	**UNITS**	**Manufacturer Brand Name and type**	**Price in (R)**	**DESCRIPTION OF PARTICULARS**
9.20.1	Purpose	OC / EF	**Per set**			
	Ratio	600/1				
	Burden	10VA				
	Class	5P20				
	Quantity	3				
	Insulation Level	IL 12/28/95 KV				
9.20.2	Purpose	Diff	**Per set**			
	Burden	10VA				
	Ratio	600/1				
	Class	PX				
	Quantity	3				
	Insulation Level	IL 12/28/95 KV				
9.20.3	Purpose	Metering	**Per set**			
	Burden	600/300/200/1				
	Ratio	10VA				
	Class	0.5				
	Quantity	3				
	Insulation Level	IL 12/28/95 KV				
9.20.4	Ratio	60/30/5 (price for local Panel CT's)	**Per set**			
	Purpose	OC / EF				
	Burden	10VA				
	Class	5P20				
	Insulation Level	IL 12/28/95 KV				
	Quantity	3				
9.20.5	Test block PK2-4way	YES (OC/EF, Differential and Metering)	**Each**			

Table 64: Reyrolle Current Transformer

9.21 The following EXISTING CIRCUIT BREAKERS must be repaired: (Strip &Quote)

Repair, Strip & Quote means that the Service provider must submit a quotation for the repairs and then invoice after repairs.

Item	Make	Type
9.21.1	Reyrolle LMS	LMS/X1/QMRO
9.21.2	Reyrolle LMR	LMR/X2/QMRO
9.21.3	Reyrolle LMT	LMT2/X31/QM
9.21.4	Actom	SBV4E/2000/25/SI and SBV4/80/20/S1
9.21.5	Actom	SBV3E/2000/25/SI
9.21.6	Johnson & Phillips	PDB/A/2Z and TSB16
9.21.7	GEC	PDB/A/400
9.21.8	HAWKER SIDDELEY	VIL-6 and R4/1 and V4/1 and D6XD
9.21.9	FIRST ELECTRIC	JB621
9.21.10	BRUSH	W4/11 and S4
9.21.11	LONG & CRAWFORD	AVS2
9.21.12	ALSTOM	AGVB-800/20/S and SBV4/800/20-S1
9.21.13	SACE BERGAMO	RM1235
9.21.14	BRITISH THOMPSON	BTH/JB621 and LC/B3
9.21.15	BRUSH	W4/11
9.21.16	NULEC	N24S-ACR-SF6-24-12-150
9.21.17	JG STATTER	VTGR150
9.21.18	YORKSHIRE	YSF6
9.21.19	RMU Actom	K3 oil and gas
9.21.20	RMU Magenefix	Dry Type Air
9.21.21	RMU GEC	T3 oil
9.21.22	RMU ABB	Gas
9.21.23	RMU Schneider	Gas
9.21.24	RMU Tiger	oil

Item	Make	Type
9.21.25	N-Series NULEC switchgear outdoor pole mounted.	Sf6 Gas
9.21.26	E-Series NULEC switchgear outdoor pole mounted.	Sf6 Gas
9.21.27	Transport costs	Transport for **strip and quote only** AA rates basis

Table 65: EXISTING CIRCUIT BREAKERS REPAIRS.

9.22 Price for switching- and spring-charges handles (set) on the following types of existing switchgear.

Item	Make	Type	Price per set	Delivery period in weeks
9.22.1	Reyrolle LMS	LMS/X1/QMRO		
9.22.2	Reyrolle LMR	LMR/X2/QMRO		
9.22.3	Reyrolle LMT	LMT2/X31/QM		
9.22.4	Actom	SBV4E/2000/25/SI		
9.22.5	Johnson & Phillips	PDB/A/2Z and TSB16		
9.22.6	GEC	PDB/A/400		
9.22.7	SIDDELEY	VIL-6 and R4/1 and V4/1 and D6XD		
9.22.8	FIRST ELECTRIC	JB621		
9.22.9	BRUSH	W4/11 and S4		
9.22.10	LONG & CRAWFORD	AVS2		
9.22.11	ALSTOM	AGVB-800/20/S and SBV4/800/20-S1		
9.22.12	SACE BERGAMO	RM1235		
9.22.13	BRITISH THOMPSON	BTH/JB621 and LC/B3		
9.22.14	BRUSH	W4/11		
9.22.15	NULEC	N24S-ACR-SF6-24-12-150		
9.22.16	JG STATTER	VTGR150		

Item	Make	Type	Price per set	Delivery period in weeks
9.22.17	YORKSHIRE	YSF6 (Sf6gas)		
9.22.18	RMU Actom	K3 oil and gas		
9.22.19	RMU Magenefix	Dry Type Air		
9.22.20	RMU GEC	T3 oil		
9.22.21	RMU ABB	Gas		
9.22.22	RMU Schneider	Gas		
9.22.23	RMU Tiger	oil		
9.22.24	Nulec switchgear outdoor pole mounted.	Sf6 Gas		
9.22.25	Lockable wall mounted cabinet to house all switching handle and specific tools.	Steel 1,5 m wide x 2mHigh and 500 mm deep.		

Table 66: Existing Circuit Breakers Levers

9.23 General spare list that must be supplied on existing equipment.

Item	Make	Type	Unit	Price in (R)
9.23.1	Reyrolle switchgear	LMT.LMR& LMS 32VDC trip coils	Each	
9.23.2	Reyrolle switchgear	LMT,LMR&LMS 32VDC Spring Charge motors	Each	
9.23.3	Reyrolle switchgear	Mono Block bus bar side, complete with shutters. LMT,LMR&LMS	Each	
9.23.4	Reyrolle switchgear	Monoblock Cable side, complete with shutters. LMT,LMR&LMS	Each	
9.23.5	Reyrolle switchgear	800Amp Circuit breaker contacts (Female)		
9.23.6	GEC Type AG16	32VDC trip coils	Each	
9.23.7	GEC Type AG16	32VDC Closing coils	Each	
9.23.8	GEC Type AG16	Rubber tank packing	Each	
9.23.9	GEC Type AG16	800A, Mono Block bus bar side, complete with shutters. (female)	Each	

Item	Make	Type	Unit	Price in (R)
9.23.10	GEC Type AG16	800Amp, Monoblock Cable side, complete with shutters and bus bar brass connector blocks/bus bars. (female)	Each	
9.23.11	GEC Type AG16	1250A, Mono Block bus bar side, complete with shutters. (male)	Each	
9.23.12	GEC Type AG16	1250Amp, Monoblock Cable side, complete with shutters and bus bar brass connector blocks/bus bars. (male)	Each	
9.23.13	GEC Type AG16	800Amp U-poke moving contacts	Set of 3	
9.23.14	GEC Type AG16	1250Amp U-Poke moving contacts	Sey of 3	
9.23.15	GEC Type AG16	800Amp rose fix contacts	Set of 6	
9.23.16	GEC Type AG16	1250Amp rose fix contacts	Set of 6	
9.23.17	GEC Type AG16	110VDC trip coils	Each	
9.23.18	GEC Type AG16	110VDC Closing coils	Each	
9.23.19	Actom SBV4	110VDC trip coils	Each	
9.23.20	Actom SBV4	110VDC Closing coils	Each	
9.23.21	Actom SBV4	32VDC trip coils	Each	
9.23.22	Actom SBV4	32VDC Closing coils	Each	
9.23.23	Actom SBV4-E	110VDC trip coils	Each	
9.23.24	Actom SBV4-E	110VDC Closing coils	Each	
9.23.25	Actom SBV4-E	32VDC trip coils	Each	
9.23.26	Actom SBV4-E	32VDC Closing coils	Each	
9.23.27	Actom SBV4	32VDC spring charge motors	Each	
9.23.28	Actom SBV4	110VDC spring charge motors	Each	
9.23.29	Actom SBV4-E	32VDC spring charge motors	Each	
9.23.30	Actom SBV4-E	110VDC spring charge motors	Each	
9.23.31	Actom SBV4	800A, Mono Block bus bar side, complete with shutters. (female)	Each	
9.23.32	Actom SBV4	800Amp, Monoblock Cable side, complete with shutters and bus bar brass connector blocks/bus bars. (female)	Each	
9.23.33	Actom SBV4-E	1250A, Mono Block bus bar side, complete with shutters. (male)	Each	

Item	Make	Type	Unit	Price in (R)
9.23.34	Actom SBV4-E	1250Amp, Monoblock Cable side, complete with shutters and bus bar brass connector blocks/bus bars. (male)	Each	
9.23.35	Actom SBV4-E	2000A, Mono Block bus bar side, complete with shutters. (male)	Each	
9.23.36	Actom SBV4-E	2000Amp, Monoblock Cable side, complete with shutters and bus bar brass connector blocks/bus bars. (male)	Each	
9.23.37	Actom SBV4-E	800Amp, Crip contacts on circuit breaker, complete with insulated bus bar.	Set of 6	
9.23.38	Actom SBV4-E	1250Amp, Crip contacts on circuit breaker, complete with insulated bus bar.	Set of 6	
9.23.39	Actom SBV4-E	2000Amp, Crip contacts on circuit breaker, complete with insulated bus bar.	Set of 6	
9.23.40	Actom SBV4-E	Rack-in block on panel for circuit breaker spiral.	Each	
9.23.41	Actom SBV4-E	230 Vac rack-in motor for circuit breaker into panel.	Each	
9.23.42	Actom SBV4-E	Remote pendant control, 8m long with plug sock on panel.	Each	
9.23.43	Actom SBV4-E	12kV Potential transformer with top plate base and shutters. 1. Ratio=11000/110V, 2. Burden & Accuracy=0.5 3. Voltage factor= 1.9 4. 3 Limps. 5. Cable side with 3 insulated VT risers bus bars.	Each	
9.23.44	Actom SBV4-E	3Amp HT HRC fuses.	Each	
9.23.45	3M	10m x120mm Red heat shrink (Before shrink)	Per/roll	
9.23.46	3M	10m x180mm Red heat shrink (Before shrink)	Per/roll	
9.23.47	3M	Scotch Fill tape	Per/roll	
9.23.48	3M	23 rubber tape	Per/roll	
9.23.49	Reyrolle	Sf6 gas fittings, 5m pipe and gages for LMR,LMT,LMS type breakers.	Per set.	

Table 67: Spares Existing equipment

9.24 Spares to be supplied by the successful bidder on new equipment.

Item	Description	Unit of Measurement	Manufacturer Brand Name and type	Unit Price in (R)	Delivery Time
9.24.1	32 Volt trip coil 32 Volt coil	Each Each			
9.24.2	110 Volt trip coil	Each			
9.24.3	110 Volt Closing coil	Each			
9.24.4	110 Volt DC Spring charges motor	Each			
9.24.5	Vacuum Bottle replacement per set 400 Amp	Set of Three			
9.24.6	Vacuum Bottle replacement per set 1600 Amp	Set of Three			
9.24.7	Vacuum Bottle replacement per set 2000 Amp	Set of Three			
9.24.8	SF6 gas gauges for refilling of Sf6 gas on tendered for equipment.	Set of Three			
9.24.9	Auxiliary contacts rotor switch for 110 Volt breaker	Each			
9.24.10	Auxiliary contacts rotor switch for 32 Volt breaker	Each			
9.24.11	Set of limit switches per circuit breaker	Per/set			
9.24.12	Touch-up paint 1 litre tin for panels	500ml			
9.24.13	Set of Three (3) 400 Amp Cable side spouts (Mono blocks)	Set of Three			
9.24.14	Set of Three (3) 400amp Busbar side spouts (Mono blocks)	Set of Three			
9.24.15	Set of Three (3) 800 Amp Cable side spouts (Mono blocks)	Set of Three			
9.24.16	Set of Three (3) 800amp Busbar side spouts (Mono blocks)	Set of Three			
9.24.17	Set of Three (3) 2000amp Busbar side spouts (Mono blocks)	Set of Three			
9.24.18	Set of Three (3) 2000 Amp Cable side spouts (Mono blocks)	Set of Three			
9.24.19	LED type lamp indicator Red, Yellow, Clear and green.	Set of Three			
9.24.20	12 kV Surge arresters x Three (3)	Set of Three			
9.24.21	Voltage Transformer, 11000/110 V, 100VA, 3 limb, Voltage factor 1.9, accuracy class 0.5. Complete with base.	Each			

Item	Description	Unit of Measurement	Manufacturer Brand Name and type	Unit Price in (R)	Delivery Time
9.24.22	Set of Three (3) Voltage transformer, Cu busbar raisers on the cable side.	Set of Three			
9.24.23	Set of Three (3) Voltage transformer, Cu busbar raisers on the busbar side.	Set of Three			
9.24.24	Current transformers 600/1,5P20, 10VA, IL 12/28/75 kV.	Each			
9.24.25	Current transformers 600/1, class X, IL 12/28/75 kV.	Each			
9.24.26	Current transformers 300/200/100/5, class 0.5, IL 12/28/75 kV.	Each			
9.24.27	Current transformers 60/30/5, class 0.5, IL 12/28/75 kV.	Each			
9.24.28	Dual Current Transformers 600/1,10P10, 10VA, IL 12/28/75 kV. Current transformers 300/200/100/5, class 0.5, IL 12/28/75 kV.	Each			
9.24.29	Dual Current Transformers 600/1,10P10, 10VA, IL 12/28/75 kV. Current transformers 60/30/5, class 0.5, IL 12/28/75 kV.	Each			
9.24.30	Plug sock for pendant control on panels, price per each.	Each			
9.24.31	Safety side wall for panels (Fire wall)	Each			
9.24.32	Hand-held remote control	Each			

Table 68: Spares New Equipment

9.25 Outdoor Circuit Breakers 800 and 1250 Amp, 12kV VCB. (New)

Outdoor Vacuum Circuit Breakers must include the outdoor current transformers on the same structure. CENTLEC can order the breakers with 1Amp or 5Amp CT's and with Voltage transformer and extension bracket. This must be operated locally and remotely with selector switches.

Item	Description	Unit of Measure-ment	Manufacturer Brand Name and Type	Unit Price in (R)	Delivery Time
9.25.1	Circuit breaker, 800 Amp, with 1Amp CT's Complete	Each			
9.25.2	800 Amp with 5Amp CT's Complete	Each			
9.25.3	1250 Amp with 1Amp CT's Complete	Each			
9.25.4	1250 Amp with 5Amp CT's Complete	Each			
9.25.5	1Amp CT's	P/Set of 3			
9.25.6	5Amp CT's	P/Set of 3			
9.25.7	12kV Potential transformer with expansion bracket 1100/110V, 3 LIMPS, Burden & Accuracy=0.5,Voltage factor= 1.9	Each			
9.25.8	12kV Potential transformer with expansion bracket 1100/110V, 5 LIMBS, Burden & Accuracy=0.5,Voltage factor= 1.9	Each			
9.25.9	110VDC Trip coil	Each			
9.25.10	110VDC Closing coil	Each			
9.25.11	110VDC Spring charge motor	Each			
9.25.12	Manual operating, opening and closing handles	Set			
9.25.13	Auxiliary switch	Each			
9.25.14	Oil cushion unit	Each			

Item	Description	Unit of Measure-ment	Manufacturer Brand Name and Type	Unit Price in (R)	Delivery Time
9.25.15	Heater 220Volt AC	Each			

Table 69: Outdoor Circuit Breakers 800

9.26 Existing Equipment Voltage transformers with top plates included.

Item	Description	Specification	Unit of meas-urement.	Unit Price in (R)	Delivery Time
9.26.1	**GEC, Type AG16**		Each		
	Install VT	Yes			
	Ratio	11000/110/63.5 Volts			
	Burden and Accuracy	100 VA Class 0.5			
	Voltage Factor	1.9			
	Top plate VT cable side	Yes			
	VT raiser busbars	12kV Insulated			
9.26.2	**Actom, Type SBV3&4**				
	Install VT	Yes	Each		
	Ratio	11000/110/63.5 Volts			
	Burden and Accuracy	100 VA Class 0.5			
	Voltage Factor	1.9			
	Top plate VT cable side	yes			
	VT raiser busbars	12kV Insulated			
9.26.3	**Hawker Siddeley Type: VIL-6 and R4/1 and V4/1 and D6XD**				
	Install VT	Yes	Each		

	Ratio	11000/110/63.5 Volts			
	Burden and Accuracy	100 VA Class 0.5			
	Voltage Factor	1.9			
	Top plate VT cable side				
	VT raiser busbars	12kV Insulated			
9.26.4	**Reyrolle Types: LMR, LMT and LMS**				
	Install VT	Yes	Each		
	Ratio	11000/110/63.5 Volts			
	Burden and Accuracy	100 VA Class 0.5			
	Voltage Factor	1.9			
	Top plate VT cable side	Yes			
	VT raiser busbars	12kV Insulated			
9.26.5	**Yorkshire Type: Ysf6**				
	Install VT	Yes	Each		
	Ratio	11000/110/63.5 Volts			
	Burden and Accuracy	100 VA Class 0.5			
	Voltage Factor	1.9			
	Top plate VT cable side	Yes			
	VT raiser busbars	12kV Insulated			

Table 70: Existing Voltage Transformers

9.27 TRAVEL & SUBSISTENCE

The bidder must take note that all travel and subsistence will be as per the entity`s S&T policy. The table below will be used for each CENTLEC official participating.

Table 71: Travel and Subsistence Pricing

Description	Class	Unit of measure	Price in Rands (R)
Flights	Economy (Local Travel)	Per person	
Accommodation	3 Star hotel	Per person	
Meals	Breakfast, lunch, and supper	Per person	
Car Rental	Group B	Per trip	
Shuttle service (for a group)		Per trip	

5. CONTACT INFORMATION

10.1 For any further technical information regarding the document contents please contact P.J. Niemann at piet.niemann@centlec.co.za , Lindiwe Kalane at lindiwe.kalane@centlec.co.za or Teboho Nkala at teboho.nkala@centlec.co.za and all queries must be done in writing, the email address provided serves this purpose. The answer to one question will be sent to all the other prospective bidders that have bought the bid documents.

10.2 For Supply Chain Related questions, please contact Me. Palesa Makhele at Palesa.makhele@centlec.co.za

6. ANNEXURES

The same drawings for panel construction and layout must be utilized for 11kV and 22kV switchgear. Only the labeling must be as follows:

1. 11kV switchgear must be labelled A1 to A10
2. 22kV switchgear must be labelled 22A1 to 22A10.

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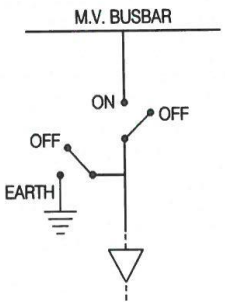


DIAGRAM 1/10
SCHEDULE A1
SWITCH-DISCONNECTOR

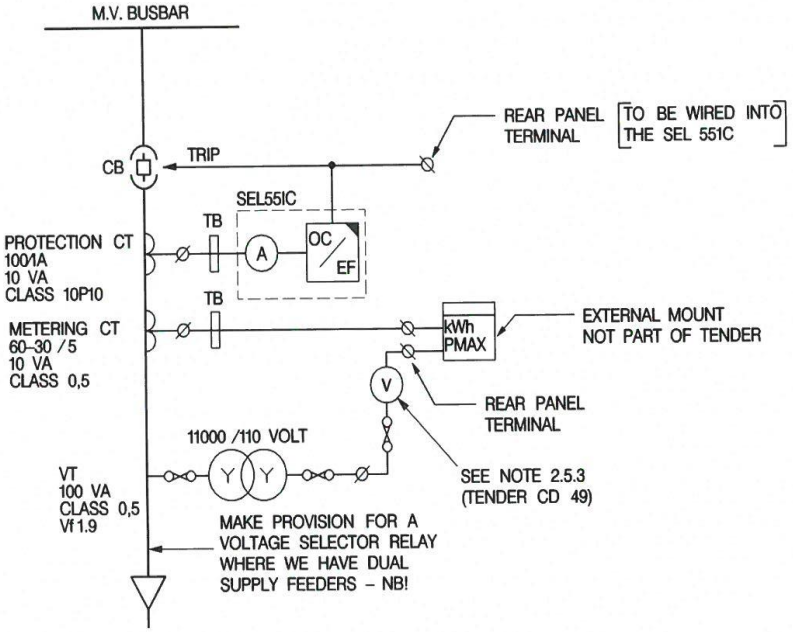
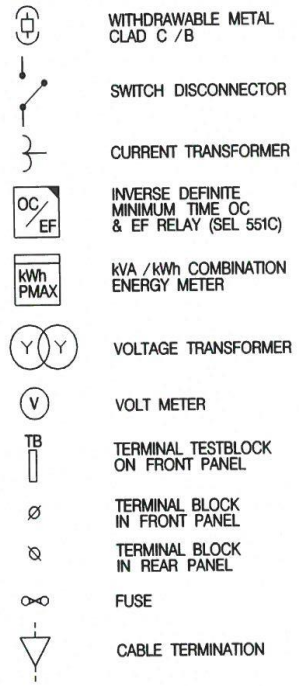


DIAGRAM 2/10
SCHEDULE A2
MV CONNECTION <1 MVA



NOTE 2.5.2

THE CONNECTION OF THE HT SIDE OF VT, SHALL BE CONNECTED ON THE CABLE SIDE, UNLESS OTHERWISE INDICATED.

REVISION No.	REVISION DATE
C	28 AUGUST 2018
B	08 DECEMBER 2010
A	05 AUGUST 2009

CENTLEC (S.O.C.)Ltd
Reg No 2003/011612/30
PRIVATE BAG X14, BRANDHOF 9324
Tel: 051 - 4092238 Fax: 051 - 4092388

DESIGNED	SCALE	PLANNING DIVISION	PLANNING DIVISION	PLANNING DIVISION	REGIONAL SERVICES & SFS	SYST. UTILIZATION & PROCESS ENG.	EXEC. ENGINEERING : WIRES
T. NKALA	N.T.S.	(First Draught. D & D) Acting	K BOOYSEN (Chief Eng. Ass. DEV.)	X MBALI (MANAGER DEVELOPMENT) ACT.	(GEN. MANAGER)	(GEN. MANAGER)	(EXEC. MANAGER ENG.)
DRAWN	DATE	PLANNING DIVISION	PLANNING DIVISION	PLANNING DIVISION	NETWORK OPP. & MAINTENANCE	RETAIL SERVICES	
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CENTLEC EXECUTIVE OFFICER
A MGOQI (Pr. TECH. ENG.) C.E.O.

TITLE
SCHEMATIC DIAGRAM FOR MV SWITCHGEAR

DRAWING Nr. TS - 9 - 7 | TEKENING No. | REV. C

THE C.A.D. REFERENCE NUMBER IS: H/DGN/TECH-STD

A4 SHEET

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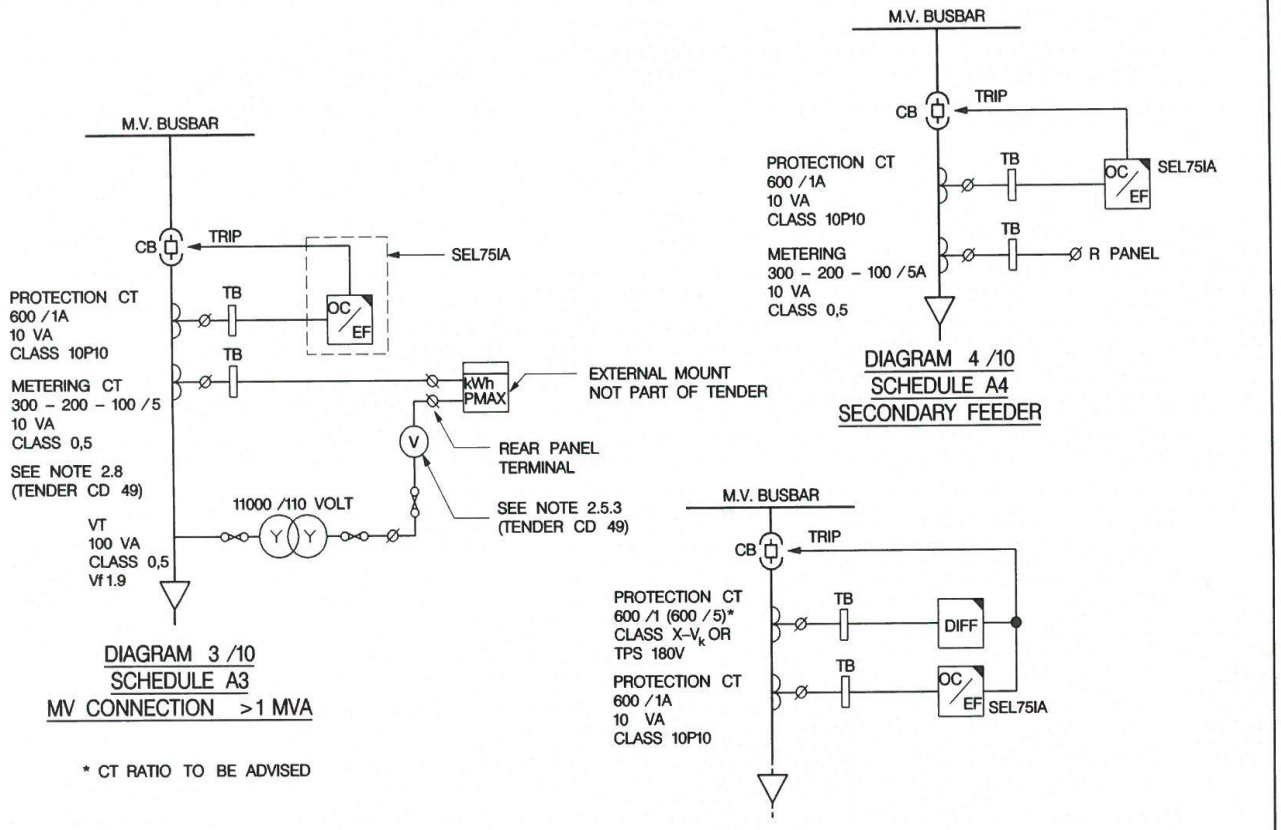

NOTE 2.5.2

THE CONNECTION OF THE HT SIDE OF VT, SHALL BE CONNECTED ON THE CABLE SIDE, UNLESS OTHERWISE INDICATED.

- WITHDRAWABLE METAL CLAD C /B
- CURRENT TRANSFORMER
- OC/EF — INVERSE DEFINITE MINIMUM TIME OC & EF RELAY (SEL551C)
- DIFF — PILOT WIRE PROTECTION RELAY (SOLKOR RF)
- kWh PMAX — kVA /kWh COMBINATION ENERGY METER
- TRF TEMP TRIP — TRANSFORMER TEMPERATURE TRIP RELAY (SEL551C)
- Y Y — VOLTAGE TRANSFORMER
- V — VOLT METER
- TB — TERMINAL TESTBLOCK ON FRONT PANEL
- ⌀ — TERMINAL BLOCK IN FRONT PANEL
- ⊗ — TERMINAL BLOCK IN REAR PANEL
- FUSE
- CABLE TERMINATION

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	DRAWN THEA VAN REENEN	DATE 1997 – 11 – 20	PLANNING DIVISION W DE JAGER (Chief Eng. Ass. DESIGN)	PLANNING DIVISION M RADEBE (MANAGER DESIGN) ACT.	PLANNING DIVISION B MOTSHWENE (GEN. MANAGER D & D) ACT.	NETWORK OPP. & MAINTENANCE (GEN. MANAGER)	RETAIL SERVICES (GEN. MANAGER)	L KRITZINGER (Pr. ENG.) TECHNICAL ADVISOR ACT.

CENTLEC EXECUTIVE OFFICER

A MGOQI (Pr. TECH. ENG.)
C.E.O.

TITLE: SCHEMATIC DIAGRAM FOR MV SWITCHGEAR

DRAWING Nr. TS – 9 – 8 REV. C

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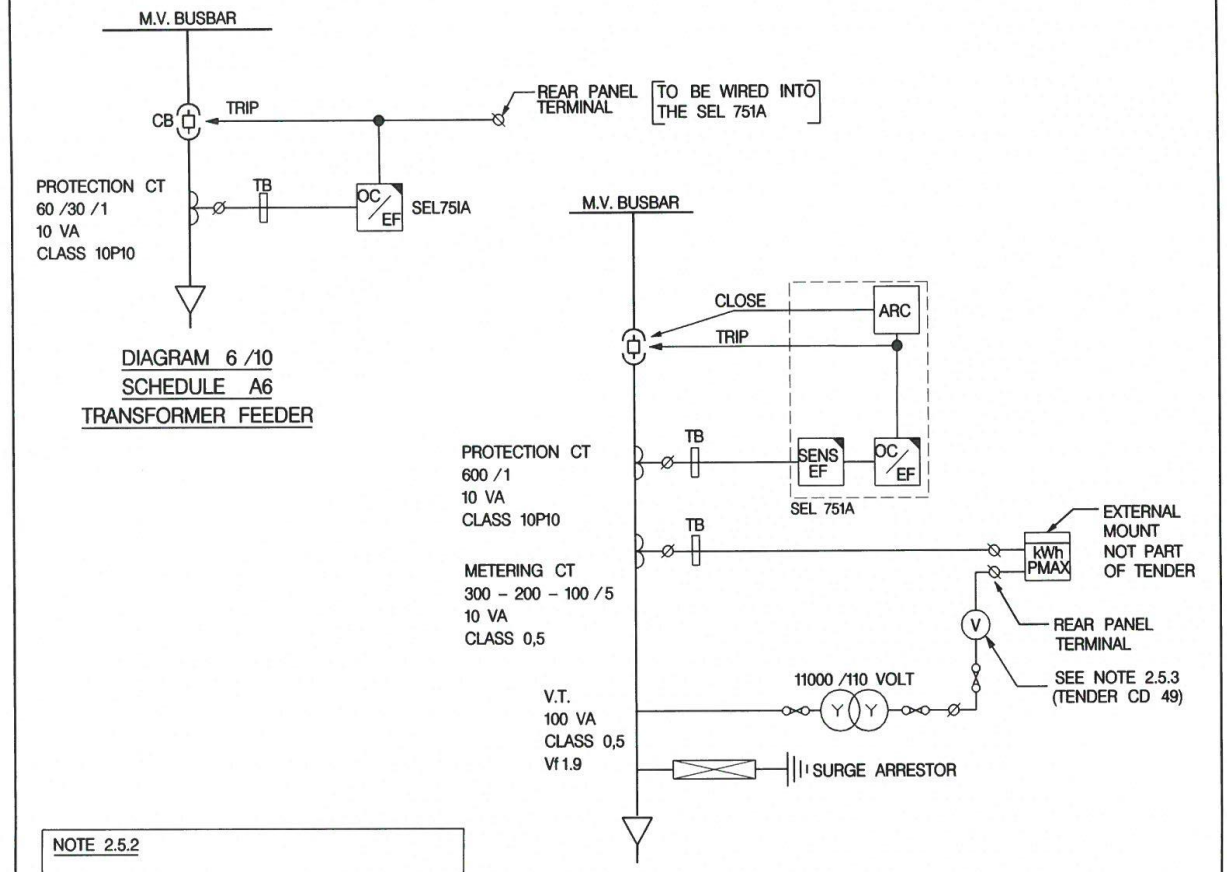

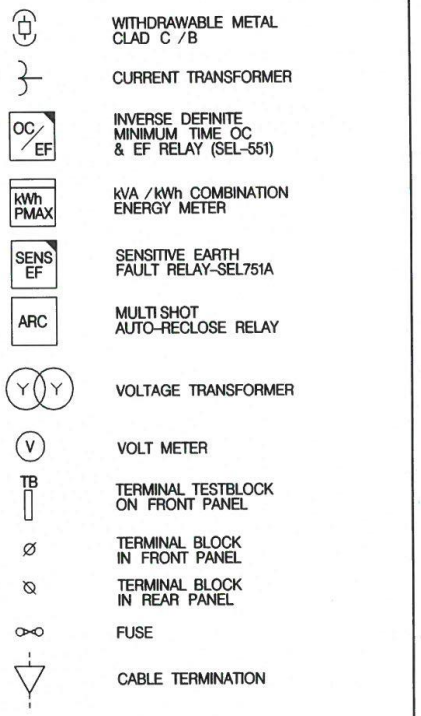

A — REVISION DATE: 28 AUGUST 2018

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	DRAWN THEA CLOETE	DATE 20 – 11 – 1997	PLANNING DIVISION W DE JAGER (Chief Eng. Ass. DESIGN)	PLANNING DIVISION M RADEBE (MANAGER DESIGN) ACT.	PLANNING DIVISION B MOTSHWENE (GEN. MANAGER D & D) ACT.	NETWORK OPP. & MAINTENANCE (GEN. MANAGER)	RETAIL SERVICES (GEN. MANAGER)	L KRITZINGER (Pr. ENG.) TECHNICAL ADVISOR ACT.	A MGOQI (Pr. TECH. ENG.) C.E.O.	DRAWING Nr. TS – 9 – 9 REV. A

THE C.A.D. REFERENCE NUMBER IS: H/NEW-DGN/TS

A4 SHEET

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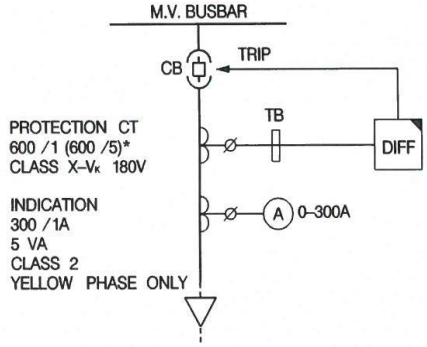
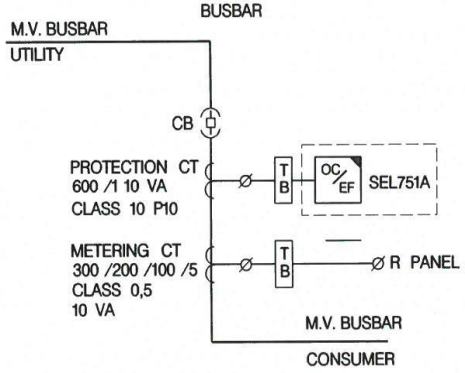


DIAGRAM 8 /10 – SCHEDULE A8
PRIMARY FEEDER (IN-COMING)

VT TO BE INSTALLED ON THE ADJACENT FEEDER ON THE UTILITY BUSBAR



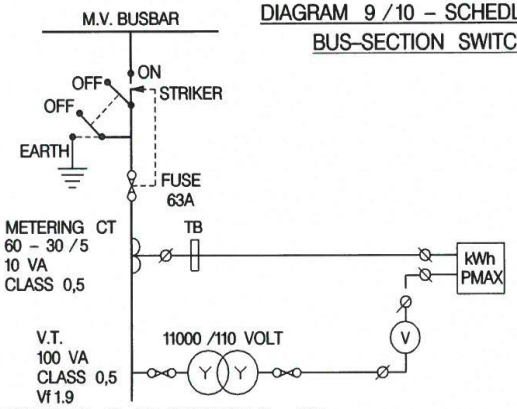
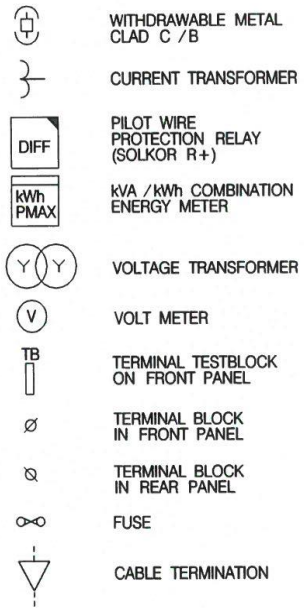


DIAGRAM 9 /10 – SCHEDLUE A9
BUS-SECTION SWITCH

DIAGRAM 10 /10 SCHEDULE A10
FUSED SWITCH DISCONNECTOR
WITH METERING

NOTE 2.5.2

THE CONNECTION OF THE HT SIDE OF VT, SHALL BE CONNECTED ON THE CABLE SIDE, UNLESS OTHERWISE INDICATED.



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