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CEB
SPECIFICATION

**12 & 36 kV AUTOMATIC CIRCUIT
RECLOSERS AND
LOAD BREAK SWITCH WITH
SECTIONALIZING FACILITY**



CEYLON ELECTRICITY BOARD
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SPECIFICATION FOR 12/ 36 kV AUTOMATIC CIRCUIT RECLOSERS AND LOAD BREAK SWITCH WITH SECTIONALIZING FACILITY

1.0 SCOPE

This specification covers the general requirements of the design, manufacturing and testing of under mentioned medium voltage Automatic Circuit Recloser (AR) and Load Break Switch with sectionalizing facility (LBS-SF) used in 12kV and 36kV overhead distribution system of CEB.

1. 12kV/36kV, 400A Automatic Circuit Reclosers, with/without Communication Module.
2. 36 kV, 800 A Automatic Circuit Reclosers, with/without Communication Module.
3. 12kV / 36 kV, Load Break Switch with sectionalizing facility, with/without Communication Module.
4. Modems at PC/Control center end.

The procurement entity shall prescribe one of the above categories in price schedule indicating the relevant categories.

2.0 SYSTEM PARAMETERS

(a)	Nominal voltage (U)	11 kV	33 kV
(b)	System highest voltage (Um)	12 kV	36 kV
(c)	System frequency	50 Hz \pm 5%	
(d)	Method of earthing	Effectively/ Non-Effectively earthed	Non Effectively earthed
(e)	System faults level	12.5 kA	16 kA

3.0 SERVICE CONDITIONS

(a)	Annual average ambient temperature	30 °C
(b)	Maximum ambient temperature	40 °C
(c)	Maximum relative humidity	90%
(d)	Environmental conditions	Humid tropical climate with heavily polluted atmosphere (Type B in accordance with IEC 60815)
(e)	Operational altitude	From M.S.L. to 1900 m above M.S.L.
(f)	Isokeraunic (Thunder days) level	100 days
(g)	Maximum Solar Radiation	4.5 kWh/m ² /day

4.0 APPLICABLE STANDARDS

The equipment and components supplied shall be in accordance with the latest editions of the standards specified below and amendments thereof.

(a)	IEC 60060-2:2010	High-voltage test techniques - Part 2: Measuring systems
(b)	IEC 60071:2014	Insulation co-ordination



(c)	IEC 60255-1:2009	Measuring relays and protection equipment - Part 1: Common requirements
(d)	IEC 60255-27:2013	Measuring relays and protection equipment - Part 27: Product safety requirements
(e)	IEC 60255-149:2013	Measuring relays and protection equipment - Part 149: Functional requirements for thermal electrical relays
(f)	IEC 60815-1:2008	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions
(g)	IEC 60815-3:2008	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions –Part 3: Polymer insulators for a.c. systems
(h)	IEC 60870-5-101:2003	Telecontrol equipment and systems - Part 5-101: Transmission protocols - Companion standard for basic telecontrol tasks
(i)	IEC 60870-5-104:2006	Telecontrol equipment and systems - Part 5-104: Transmission protocols - Network access for IEC 60870-5-101 using standard transport profiles
(j)	IEC 61850:2013	Communication networks and systems for power utility automation
(k)	IEC 62271-1:2017	High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear
(l)	IEC 62271-111:2012	High-voltage switchgear and controlgear - Part 111: Automatic circuit reclosers and fault interrupters for alternating current systems up to 38 kV
(m)	IEC 62271-100:2012	High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers
(n)	IEC 62271-103:2011	High-voltage switchgear and controlgear - Part 103: Switches for rated voltages above 1 kV up to and including 52 kV
(o)	IEC 62271-200:2011	High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
(p)	IEC 62217:2012	Polymeric HV insulators for indoor and outdoor use – General definitions, test methods and acceptance criteria.
(q)	IEC 60529:2013	Degrees of protection provided by enclosures (IP Code)
(r)	BS EN ISO 1461:2009	Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods
(s)	ANSI C 37.60:2003	Automatic Circuit Reclosers and Fault Interrupters for AC Systems

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

5.0 BASIC FEATURES

AR and LBS-SF shall be of three phase Gas or Solid Insulated, suitable for outdoor application and shall be complete with operating mechanism, Current & Voltage sensors, protection, Auxiliary power supply, control module, programming facility and all other components necessary for installation and operation. Oil insulated type shall not be acceptable.

The AR and LBS-SF shall be able to operate with minimum maintenance and suit the conditions stated in clause number 3.0. Evidence of operational endurance in service and design features to



guarantee minimum maintenance performance shall be furnished with the offer.

5.1. General Design Features / Requirements of AR and LBS-SF.

	Requirement	AR	LBS-SF
(i)	Operating Chamber	The AR shall have self-contained reclosing chamber or chambers for each phase including operating mechanism, hermetically sealed.	The LBS-SF shall have self-contained switching chamber including operating mechanism hermetically sealed.
(ii)	Interrupting Medium	Shall be Vacuum only.	Shall be Vacuum/SF ₆ .
(iii)	Current Transformer /Sensor	CT sets for each phase to measure current and enable overcurrent, earth fault, sensitive earth fault and directional protection schemes.	CT/Current sensor sets for each phase for current measurements and to detect earth fault.
(iv)	Voltage Transformer /Sensor	<p>VT/Voltage sensor sets for each phase on both sides to measure voltage and enable over/under voltage and directional protection schemes and to find energization of both sides.</p> <p>An over voltage trip setting of 100% up to 150%, in steps of 1%, above the nominal system voltage. The under voltage setting range of 50% to 100%, in steps of 1%, below the nominal system voltage shall be provided.</p>	VT/Voltage sensor sets for each phase on both sides to measure voltage and enable over/under voltage and to find energization of both sides.
(v)	Protection Schemes		
	Frequency Protection	<p>Ability to program on user defined over frequency and under frequency.</p> <p>The over frequency setting range up to 5Hz, in steps of 0.1Hz, above the system frequency shall be provided. For under frequency the setting range down to 5Hz, in steps of 0.1Hz, below the system frequency shall be provided. An auto-close function shall be provided to enable the AR to close once the frequency returns to normal.</p>	-



	Over Current and Earth Fault operation characteristic (Inrush restraint facilities shall be also provided)	Instantaneous Standard inverse Very inverse Extreme inverse Definite time (as per IEC 60255) User defined.	-
	Over current setting range	Minimum 20A – 400A range or 20A– 800A to be covered as applicable. (Minimum resolution 1A)	-
	Earth fault operation characteristic	Minimum 10A-600A to be covered as applicable. (Minimum resolution 1A)	-
	Sensitive earth fault setting range	Minimum 4A-80A to be covered as applicable. (Minimum resolution 0.5A)	-
	Dead time setting range	0. 5 to 120 sec.	-
	Reclaim time setting range	5 sec. to 180 sec.	-
	Sequence co-ordination settings	0.1 to 0.7 seconds	0.1 to 0.7 seconds
	Minimum response time	0.1 to 0.3 seconds	0.1 to 0.3 seconds
(vi)	CT Ratio	As applicable.	
(vii)	Operating of poles	All three poles shall be operated simultaneously through a solenoid or magnetic actuator (spring) mechanism.	All three poles of the LBS-SF shall be operated simultaneously by spring assisted or magnetic actuator operating mechanism.
(viii)	Opening/Closing/locking and tripping	In case of a solenoid operating mechanism, closing solenoids shall provide energy required for tripping operation and this energy shall be stored in the tripping mechanism. Manual locking and unlocking facility of the recloser shall be provided by means of lever, which can be operated using an operating rod from the ground level in the event of failure of all the other control and indication levels. Lock and unlock position shall be clearly visible from the ground. In lock position, all operations shall be disabled and be on open position. Provisions shall be made to	The tripping shall be achieved by stored energy during closing operation and operating handle shall be provided for manual closing/opening. LBS-SF shall be able to open at normal load and close on to a fault. Provisions shall be made to achieve the intentional closing by the control panel or by a remote operator.



		<p>achieve the intentional closing by the control panel or by a remote operator.</p> <p>AR shall withstand opening and closing to faults/load.</p>	
(ix)	Ability to control using logic functions	<p>Opening and closing of the AR shall be programmable using user defined logic functions.</p> <p>Any specific hardware required for the above shall be provided.</p>	-
(x)	Ability to program the switching sequence	<p>Tripping shall be initiated by overcurrent, earth fault, sensitive earth fault and instantaneous relays, specified above.</p> <p>The control module shall be of the programmable type to carry out the required types of operations for different applications as stipulated below.</p>	-
(xi)	Automatic Switching Schemes	<p>At least 4 independent protection schemes shall be programmable.</p> <p>A scheme must have at least O-CO-CO-CO operating cycles with minimum dead times as per IEC 62271 standard.</p> <p>The AR dead times shall be individually selectable for each Auto Reclosing operation.</p> <p>If the fault is cleared by any one of the reclosing operations and the AR remains closed, it shall reset itself for another complete sequence of operations.</p> <p>A cold load pickup (CLP) feature shall be provided that allows selectable modification of protection characteristics under system power restoration conditions. Loss of supply shall be automatically detected and the recloser shall apply the CLP feature to the first shot curves, regardless of</p>	<p>Tripping after a pre-determined number of reclosing operations (less than 4) of the upstream AR shall be programmable</p> <p>It shall automatically open during auto-recloser dead time on detection of fault in the downstream and after programmed trips.</p> <p>It shall be switchable manually/remotely, when there is supply on either side OR no supply on either side OR supply on one side.</p> <p>The LBS-SF for ring circuit application, where a normally open point is kept, shall be programmable to close after a pre-identified period (adjustable) when there is no supply on other side.</p>



		whether the recloser is open or closed.	
(xii)	Open/Close position indication	A mechanical position indicator shall be provided to indicate the ON/OFF position of the LBS-SF. This indicator shall be clearly seen from the ground even under bad weather conditions. The controller shall contain a clock that can be both locally and remotely set. Better to have GPS time synchronization facility	

5.2. Common Features

- (a) AR shall be mounted to the side of concrete rectangular poles/circular tubes accommodating MV Lines of Horizontal formation.
- (b) LBS-SF shall be mounted on concrete rectangular poles/circular tubes (mounted to the side of the pole accommodating horizontally aligned lines above LBS-SF) or gantry structures (Horizontal Mounted, hanged from the steel structure accommodating horizontally aligned lines).
- (c) Mounting arrangement shall be agreed upon the delivery without additional cost. All mounting brackets and accessories shall be provided by the supplier.
- (d) The Insulation medium shall be SF₆ or Solid Dielectric.
- (e) Mechanical endurance class of AR/ LBS-SF shall be M2 and electrical Endurance class shall be E3.
- (f) Tanks for SF₆ or other shall be stainless steel or galvanized powder coated/painted steel tanks shall be used based on the design requirements of pressurized enclosures. Gaskets and joint designs shall remain gas tight under all normal service conditions. SF₆ shall comply with the requirements of BS EN 60376.

In case of SF₆ tanks

- Shall incorporate electronic or mechanical pressure sensors to monitor the SF₆ gas pressure.
- Tanks exposed to the decomposition products of SF₆ gas shall be fitted with appropriate filters sufficient for the life of the equipment.
- Gas fill valve shall be provided for topping up of the SF₆ gas.
- When the SF₆ gas pressure falls below the pre-set value the sensor shall indicate SF₆ pressure low indication on the control panel/RTU.
- The facility to lock out under very low SF₆ pressure shall be provided.

In case of all tanks

- Provision to prevent explosion during internal arc fault shall be provided. Features to ensure the safe release of internal over pressure exceeding the safe design pressure shall be provided.

- (g) All steel tanks for SF₆ or other shall be designed and treated for corrosivity environment C5 category as per ISO/EN 12944-2 .The surface shall be thorough cleaned and shall be treated with hot zinc dip/spray of minimum 50 micron thickness. Then it shall be painted with a etch primer minimum thickness of 50 micron and minimum thickness of 100 micron undercoating. Then it shall be painted with a gloss or semi-gloss paint of minimum 50 micron thickness. The ultimate dry film thickness (DFT) shall not be less than 300 microns. (ISO/EN 12944-2).



- (h) Number of full load interruptions, full fault interruptions and number of half fault interruptions that could be performed by the interrupter during its life span shall be furnished.

Remaining percentage contact wear shall be recorded in the AR/LBS-SF and shall indicate in the control panel. In the event the control panel is replaced the remaining percentage contact wear shall be down loaded to the new control panel.

- (i) The enclosure of the control cabinet shall have IP 54 or higher rating. Cabinet shall be designed for the specified service conditions, adequately ventilated and fitted with substantial door securing devices capable of ensuring entry by only authorized personnel. Cabinets shall be adequately sealed and dust protected and shall be internally treated to prevent moisture condensation.
- (j) Operations shall be recorded by a mechanical or electrical counter which can be accessed in the field via control panel display unit and field computer using the associated computer software package.
- (k) When device is in ON position automatic switching OFF for downstream faults shall be possible.
- (l) Basic selection of Local or Remote Shall be provided at control cabinet. When local position is selected automatic switching and responding for RTU commands shall be disabled and all three phases simultaneously switching ON/OFF operations should be possible from control cabinet.

When remote position is selected the respective automatic switching procedures and command execution from RTU shall be enabled.

- (m) The controller shall contain a clock that can be both locally and remotely set. It is preferable to have GPS time synchronization facility.
- (n) The source side and the load side of the Auto Recloser shall be interchangeable and protection setting shall automatically change to suit the change of direction of power flow depending on the electricity network parameters.
- (o) Tripping/ operating mechanism shall be powered by a sealed, maintenance free rechargeable battery having minimum of 4 years' service life time. The battery charging shall be facilitated by an external single phase 230 V \pm 6% supply 50Hz AND a solar energy supply where all control wiring for charging shall be included.
- Battery hold up time shall be at least two days at 6 operations per day.
 - A signal for Low Battery (before critically low) Voltage shall be indicated on the control panel and RTU.
 - Calculations shall be provided showing how many O-CO operations a fully charged battery can handle without recharging.
- (p) Surge Arrester Mounting shall be provided with suitable Steel Mounting Frame with Lifting Tackle, Surge Arrester Mounting Bracket on the source and load side.
- (q) An earthing terminal suitable to accommodate two Nos. 5mm diameter to 15 mm diameter earthing conductors shall be provided for bonding all the metal work and mounting frame to the local earthing electrodes / galvanized steel mounting structure.



- (r) Bushing/housing insulator shall be of Silicone Rubber or Hydrophobic Cycloaliphatic Epoxy and terminals shall be preferably of Palm type to accommodate copper/aluminium conductors of diameter ranging from 12mm to 20mm.

The minimum creepage distances for insulators and bushings shall comply with the IEC 60815 standard. Pollution severity category shall be "d" in accordance with IEC 60815.

- (s) All non-metal parts including insulating materials of cables shall be able to withstand effects due to ultra violet radiation.

5.3. Technical Parameters

	Technical Parameter		AR		LBS-SF	
(a)	Rated Voltage	kV	12	36	12	36
(b)	Frequency	Hz	50	50	50	50
(c)	Continuous Current Rating	A	400	400/800	400	400
(d)	Rated Short Circuit:					
	(i) Breaking current RMS	kA	12.5	16	0.4	
	(ii) Making Current Peak	kA	31.5	40	31.5	40
(e)	Short Time Current (1 Second)	kA	12.5	16	12.5	16
(f)	Insulation Level					
	(i) Impulse withstand voltage (1.2/50 s) kV peak	kV	75	170	75	170
	(ii) Power frequency withstand voltage wet (1min.)	kV	28	70	28	70
(g)	Insulator creepage distance	mm	300	900	300	900

5.4. User Interface for Control Cabinet

The Control cabinet shall communicate, archive and process all analogue and digital signals including inputs, outputs, measurements, alarms. The power supply for Control cabinet shall be provided from internal battery.

Real time and past data shall be made available either locally and remotely.

Control cabinet shall have a display panel with backlit LCD and keypad to provide fast navigation and local control. Fast navigation keys shall be able to disable with password protection. Navigation menus should be presented in easily understandable text for the operators. Basic configurations can be carried out using navigation keys and LCD display. It is also possible to read instantaneous current, voltage, power and system logs values through LCD display.

Following communication ports shall be provided for SCADA and local configuration.

- RS232 (SCADA)



- Ethernet RJ45 (SCADA)
- USB (Local configuration)

For remote monitoring and control from CEB control station, control cabinet of AR/LBS-SF shall have the facility which shall be compatible with communication module. The communication protocol shall conform to

- IEC 60870-5-101& 104 or latest versions of them.
- DNP 3.0

Electronic modules shall perform continuous diagnostic monitoring and shall contain hardware and software watchdog checking.

5.4.1. Essential Control and signals from SCADA system to be accommodated by AR/LBS-SF

Following data points shall be available-but not limited to;

	Description	AR	LBS-SF
(a)	Switch ON	Yes	Yes
(b)	Switch OFF	Yes	Yes
(c)	Work tag ON	Yes	-
(d)	Work tag OFF	Yes	-
(e)	Active protection group selection	Yes	-
(f)	Enable/Disable Overcurrent Protection	Yes	-
(g)	Enable/Disable Earth Fault Protection	Yes	-
(h)	Enable/Disable SEF Protection	Yes	-
(i)	Enable/Disable Sectionalizer function	Yes	Yes
(j)	Auxiliary supply available/not available	Yes	Yes
(k)	Battery Voltage Low	Yes	Yes
(l)	Battery Voltage Critical	Yes	Yes
(m)	Battery charging failure	Yes	Yes
(n)	Remote/ Local	Yes	Yes
(o)	Closed/Open	Yes	Yes
(p)	Work tag ON/OFF	Yes	-
(q)	Active protection group	Yes	-
(r)	Overcurrent protection ON/OFF	Yes	-
(s)	Earth Fault protection ON/OFF	Yes	-
(t)	SEF protection ON/OFF	Yes	-
(u)	Sectionalizer function ON/OFF	Yes	Yes
(v)	Recloser lockout	Yes	-
(w)	Trip due to OCF	Yes	-
(x)	Trip due to EF	Yes	-
(y)	Trip due to SEF	Yes	-
(z)	Trip due to sectionalizer function activation	Yes	Yes
(aa)	SEF Operated Phase	Yes	-
(bb)	SF ₆ Pressure – Low (if applicable)	Yes	Yes
(cc)	Voltage on source side (each phase)	Yes	Yes
(dd)	Voltage on Load side(each phase)	Yes	Yes
(ee)	Current in each phase	Yes	Yes
(ff)	Fault current in each phase	Yes	-
(gg)	SF ₆ Low Lockout	Yes	Yes



(hh)	Last reclosing operated cycles with time stamps	Yes	-
(ii)	Load Live	Yes	Yes
(jj)	Source Live	Yes	Yes
(kk)	Apparent power	Yes	Yes
(ll)	Active Power	Yes	Yes
(mm)	Reactive Power	Yes	Yes

5.4.2. User Programmable Logic Controls Performed by AR/LBS-SF

	Description	AR	LBS-SF
(a)	Auto open when malfunctions of switch and controller	Yes	-
(b)	Auto open when auxiliary AC or DC supply failure	Yes	-
(c)	Auto open when Battery level Critical	Yes	-
(d)	Auto open when Battery Charger abnormal/failure	Yes	-
(e)	Auto close when above faulty states (a,b,c,d) are cleared	Yes	-
(f)	Auto freeze when SF ₆ low lockout	Yes	Yes
(g)	Lockout when 1ph EF/SEF persists	Yes	-
(h)	Count preset dead times and open	-	Yes

5.5. Communication Module

5.5.1. At the AR/LBS-SF end

A Communication Module shall be supplied with the equipment and powered from the control cabinet in order to provide the communication facility to SCADA system using DNP3.0 , IEC 60870-5-104 protocol over cellular network as well as it shall provide the communication facility to software that described in clause 5.6 . Dial-up modems shall not be acceptable. The module shall have;

- (i) A modem which can operate in 900/1800 MHz (GSM) range and 800/900 MHz (GPRS) range and 2100 MHz (3G) range or 1800/2300 MHz (4G LTE) range.
- (ii) Tamper proof SIM Card Holder.
- (iii) A built in connector for an external antenna and antenna cable with 3m wire length.
- (iv) Minimum speed of 9.6 kbps for GSM, 40 kbps for GPRS, 2 Mbps for 3G and 6 Mbps for 4G.
- (v) Data cables to connect to equipment.
- (vi) Modem should have Ethernet port and capability of TCP/UDP port forwarding.
- (vii) If the RTU does not support to DNP3.0 communication over TCP/IP the modem should have TCP server mode to redirect data to RS 232 port on the controller.

5.5.2. At the PC end

Communication modules shall be supplied with the batch of equipment, as specified in the price schedule. It shall have;

- (i) A modem which can operate in 900/1800 MHz (GSM) range and 800/900 MHz (GPRS) range and 2100 MHz (3G) range or 1800/2300 MHz (4G LTE) range. It shall be an industrial type modem that support extensive data communication over long periods.
- (ii) Tamper proof SIM Card Holder.
- (iii) A built in connector for an external antenna and an external antenna with 3m of wire length.
- (iv) Minimum speed of 9.6 kbps for GSM, 40 kbps for GPRS and up to 2 Mbps for 3G and 6 Mbps for 4G.



- (v) Data cables to connect to PC

5.6. Communication Software

A user friendly Computer software supplied on a CD, compatible with Windows 7 or later to upload and download protection settings, to provide history information (event data logs, load profile, etc) to display breaker contact erosion data etc., shall be supplied. It shall be possible to download data stored in control unit and configure the equipment using a portable computer locally or remotely. Local interfacing should be via USB port. The software should have the facility to install on any computer without a separate license and record the event history to get the information of the access user. The software should have separate authority levels for:

- Programming, Operating and Monitoring
- Operating and Monitoring
- Monitoring

The offered software should be backward-compatible with the previous version. Required one set of interface cables shall be provided with every ten units or part thereof.

The downloaded data shall be stored in a suitable fool proof database. This data shall be able to be extracted as a delimited text format or MS Excel format.

Software shall be valid or provided with necessary keys and upgrades for at least the full life span of the equipment. The manufacturer/ supplier shall provide necessary support throughout this period. The software should facilitate remote data downloading individually from each equipment.

Relevant manuals in English language shall be provided.

6.0 REQUIREMENTS FOR SELECTION

6.1. Quality Assurance

The manufacturer shall possess ISO 9001:2015 or latest Quality Assurance Certification valid throughout the delivery period of this bid, for the manufacture of offered SF₆/Solid insulated AR /LBS-SF for the plant where manufacturing is being done. The Bidder shall furnish a copy of the ISO certificate certified as true copy of the original by the manufacturer, along with the offer.

6.2. Manufacturing Experience

The manufacturer shall have minimum of fifteen (15) years experience in manufacturing SF₆/Solid insulated AR / LBS-SF. Out of this period offered AR / LBS-SF should have been supplied successfully outside the country of the manufacturer for minimum of ten (10) for usage in utilities. The product offered which are in same voltage range shall be in service in utilities over past 5 years.

If the manufacturer has supplied similar items to CEB within last five (5) years with proven sales records; without any adverse performance records, he/she such manufacturers will be exempted from above requirements.



6.3. Type Tests

The (following) Type Test Certificates conforming to the above referred standards or any other international standard which is not less stringent, issued by:

- (a) either an accredited independent testing laboratory acceptable to the CEB or
- (b) an accredited or independent testing laboratory acceptable to the CEB where the type test have been witnessed by a reputed independent body/ CEB

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

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

List of Type Tests, Curves and special conditions:

Type Tests for AR as per IEC 62271-111

- (a) Dielectric tests on main circuits
- (b) Partial discharge tests
- (c) Surge current tests (where applicable)
- (d) Control electronic elements surge withstand capability tests
- (e) Measurement of resistance of the main current path
- (f) Temperature rise tests
- (g) Mechanical tests
- (h) Short-time withstand current and peak withstand current tests
- (i) Critical current
- (j) Line charging and cable charging current tests
- (k) Making current tests
- (l) Rated symmetrical interruption test (standard operation duty)
- (m) Tests to verify the degrees of protection of enclosures
- (n) Tightness tests (where applicable)
- (o) Minimum tripping current tests
- (p) Time-current tests

Type Tests for AR (bushing insulators) as per IEC 62217

- (a) Accelerated weathering test

Type Test Certificates for LBS-SF in accordance with the IEC 62271-103

- (a) Dielectric tests including lightning impulse withstand tests, power-frequency voltage withstand tests, and power-frequency voltage withstand tests on auxiliary and control circuits
- (b) Temperature-rise tests
- (c) Measurement of the resistance of the main circuit



- (d) Short-time withstand current and peak withstand current tests
- (e) Tests to prove the ability of the switch to make and break the specified currents
- (f) Tests to prove satisfactory mechanical operation and endurance
- (g) Verification of the protection
- (h) Tightness tests
- (i) Electromagnetic compatibility (EMC) tests
- (j) Additional tests on auxiliary and control circuits



7.0 INFORMATION TO BE FURNISHED WITH THE OFFER

The following shall be furnished with the offer.

- (a) Technical details essential submitting following clearly identifying the offered items, but not limited to:
 - (i) The Comprehensive catalogues
 - (ii) The dimensional drawings
 - (iii) Schematic diagrams
 - (iv) Calculations, graphs and tables
 - (v) Operational literature
 - (vi) Name plate drawing to scale, incorporating the particulars called for
 - (vii) Mounting arrangement drawings
 - (viii) Constructional & mounting details with electrical clearances
 - (ix) Device manual
 - (x) A copy of the manual of the software
 - (xi) Materials used for components & relevant literature and electrical properties and mechanical properties
 - (xii) Insulator assembly and shed profile
 - (xiii) DNP3 and IEC 60870-5-104 manual
 - (xiv) Modem manual and relevant software
- (b) ISO 9001:2015 or latest Quality Assurance Certificate in accordance with clause 6.1.
- (c) Manufacturer shall furnish a list of supplies with supplied item, purchaser (specifying address contact persons and contact details, country), year & quantity to prove his manufacturing experience and outside the country sales in accordance with Clause 6.2.
- (d) Type Test Certificates in accordance with the clause 6.3.
- (e) Duly filled and signed 'Annex - B: Schedule of Technical Requirements and Guaranteed Technical Particulars'.
- (f) Other relevant Technical Details, protection operating curves and Calculations.
- (g) A set of spare parts manual and technical details of the equipment and components shall be supplied with the equipment. These documents constitute a part from the equipment supplied and shall be listed with the equipment supplied to make sure that the documents are shipped along with the equipment.
- (h) The information provided should include essential circuit diagrams, general arrangement and detailed drawings of the installation, make mention of special material where used and include schedules of lubricants and all ball and roller races employed on the plant. The drawings and diagrams may be reduced to a convenient size and should be bound into the volume without inserting into cover pockets.

- (i) Protocol guide lines should be provided for all available protocols
- (j) Evidence of operational endurance in service and design features to guarantee minimum maintenance performance shall be furnished with the offer.

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

8.0 PERFORMANCE GUARANTEES AND WARRANTY

Manufacturer shall provide 1 year warranty to CEB for the items and accessories supplied under this Contract for having no defect arising from design, materials or workmanship (except in so far as the design material is required by the Purchaser's specifications) or from any act or omission of the supplier, that may develop under normal use of the supplied goods in the conditions prevailing in the country of final destination from the date of delivery to CEB stores. Manufacturer should forward the duly signed Warranty Certificate together with the letter of acceptance of the award. Three (3) years comprehensive warranty for electronic devices and cards in the control panel shall be provided.

Manufacturer should provide CEB a performance guarantee with the letter of acceptance of the award ensuring service levels and technical performance given in his offer are met and maintained during the first year after the delivery to CEB stores.

9.0 SPARES

The Annex - A indicates the suggested spares for a 10 year trouble free service. That shall include the minimum percentage stipulated in Annex – A of quantity from each category and rating (rounding up to the highest integer). However, the Bidder shall indicate in the schedule of prices the type of spares and the quantities recommended by the manufacturer for the product they have offered. It is the bidder's responsibility to include all the spares for all ratings in this list. If any spare item is missed, at evaluation stage a cost will be assigned for missed item, based on the comparable item of bid or the similar cost of next highest offer. All the prices of spares shall be indicated and the total cost of spares will be taken for the evaluation.

10.0 LABELING/MARKING

10.1. Identification and Labeling/Marking

The item shall be marked/ labeled/engraved/embossed indelibly, legibly and in a weatherproof and abrasion proof manner as follows:

- (a) the word "CEB"
- (b) Ratings: voltage U_0/U (U_m)/ current / size / capacity
- (c) Standard adopted
- (d) Product type
- (e) year of manufacture, manufacturer's name or trade mark, warranty period
- (f) Other markings stipulated in the standards

Each box of similar items shall be labeled (with clear stencil) with the following;

- (a) "PROPERTY OF CEYLON ELECTRICITY BOARD"
- (b) Bid No. Serial No.....
- (c) Manufacturer's identification.
- (d) Item Type, Ratings: voltage U_0/U (U_m)/ current / size / capacity.
- (e) Number and year of standard adopted.
- (f) Net Weight & Gross Weight in kg.



- (g) No of items.
- (h) Year of Manufacture.

11.0 INSPECTION AND TESTING

11.1. Routine Tests

The (following) Routine Test Certificates conforming to the relevant standards (depending on the choice of the applicable standards) shall be furnished for the observation of the Engineer appointed by CEB at the time of inspection. In addition, the routine test certificates shall be sent with the shipment of cables.

AR: The following Routine Tests in accordance with IEC 62271-111 shall be carried out on all units and test report shall be furnished for the observation of the Engineer appointed by the purchaser at the time of inspection.

- (a) Dielectric withstand test; one minute dry power-frequency;
- (b) Control, secondary wiring and accessory devices check tests;
- (c) Measurement of the resistance of main circuit;
- (d) Tightness tests;
- (e) Reclosing and overcurrent calibration;
- (f) Partial discharge test;
- (g) No load mechanical operation test.

LBS-SF: The following routine test shall be carried out on all equipment as per IEC 62271-103.

- (a) Dielectric test on the main circuit
- (b) Tests on auxiliary and control circuits
- (c) Measurement of the resistance of the main circuit
- (d) Tightness test
- (e) Design and visual checks

11.2. Inspection

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

11.3. Acceptance Tests

Unless specified below, visual inspection, dimensional checks, sample tests specified in the relevant standards, selected type tests and the routine tests conducted for the selected sample in addition to the complete routine test reports shall form the acceptance test report.

The following Acceptance/Sample tests for AR as per IEC 62271-111 shall be witnessed by the Engineer.

- (a) Control unit calibration checks
- (b) Wiring and operating checks
- (c) Dielectric withstand tests
- (d) Mechanical operation checks
- (e) Leakage check



- (f) Temperature rise test
 - (g) Duty Cycle Tests
 - (h) Verification of remote operation with the software
 - (i) Dimensional tests
- The Control unit calibration checks, wiring, operating and functional tests shall be carried out to verify whether the equipment is fully conforming to the Clauses 5.1 and 5.4.1

The following Acceptance/Sample tests as per IEC 62271-103 for LBS-SF shall be witnessed by the Purchaser.

- (a) Dielectric withstand tests.
 - (b) Making and breaking tests.
 - (c) Short time withstand and peak withstand current tests.
 - (d) Measurements of resistance of the main circuit
 - (e) Temperature-rise tests.
 - (f) Dimensional tests
- The Control unit calibration checks, wiring, operating and functional tests shall be carried out to verify whether the equipment is fully conforming to the Clauses 5.1 and 5.4.1

12.0 ANNEXES

- Annex – A : Schedule of Spares
- Annex – B1 : Schedule of Technical Requirements and Guaranteed Technical Particulars – AR
- Annex – B2 : Schedule of Technical Requirements and Guaranteed Technical Particulars – LBS-SF
- Annex – C : Non-Compliance Schedule



Annex A

SCHEDULE OF SPARES
(To be filled and submit with the bid)

The approximate requirement of spares suggested by the purchaser is indicated below. The total price of the spares also shall be indicated in the schedule of prices.

		Quantity% (Specified by the Procurement Entity)	Unit FOB	Total FOB
	AR			
(a)	Control Panel			
(b)	Charging Circuit modules (Internal/External)			
(c)	Control card including all IEDs			
	LBS-SF			
(a)	Control Panel			
(b)	Charging Circuit modules (Internal/External)			
(c)	Control Card			

Total FOB value

Total CIF value

Note

- 1: CEB reserves the right of ordering all the items or selected items depending on the requirement.
- 2: Above quantity shall be equal to the percentage of the ordering quantity, rounded up to the closest integer. The minimum quantity shall be considered as one.



ANNEX- B1

SCHEDULE OF TECHNICAL REQUIREMENTS AND GURANTEED TECHNICAL PARTICULARS
(CEB Requirements shall be filled by the procurement entity and information of the offer shall be filled by the manufacturer)

Automatic Circuit Recloser

		CEB Requirement	Offered
1.	Name of the Manufacturer		
2.	Country of Origin		
3.	Class Designation (Catalogue ref. No.)		
4.	Type		
	i. Indoor/out door	Outdoor	
	ii. Insulation media (Solid/SF ₆)	Solid/SF ₆	
	iii. Interruption media (Vacuum/SF ₆)	Vacuum	
5.	Hermetically sealed	Yes/No	Yes
6.	Rated voltage	kV	
7.	Minimum rated continuous Current	A	400/800
8.	Rated frequency	Hz	50
9.	Rated Short Circuit		
	i. Symmetrical interrupting current (rms)	kA	As per clause 5.3
	ii. Asymmetrical interrupting current (rms)	kA	
	iii. Making Current (peak)	kA	
10.	X/R ratio		
11.	Short time withstand current (1 second)	kA	As per clause 5.3
12.	Insulation level		
	i. Impulse withstand voltage (1.2/50 μs) kV peak	kV	As per clause 5.3
	ii. Power frequency withstand voltage wet (1min.)	kV	
13.	Type of Operating mechanism		
	i. Closing		
	ii. Tripping		
14.	Controllers for ARs		
	i. Types of Over Current operation characteristics provided		As per clause 5.1
	ii. Over current setting range		
	iii. Earth fault operation characteristic		
	iv. Std. Earth fault current setting range		
	v. Sensitive earth fault setting range		
	vi. Dead time setting range		
	vii. Reclaim time setting range		
	viii. No of Protection Setting Groups		
	ix. Whether Change of Protection Group Setting with change of direction of Power flow is available	Yes/No	
15.	Whether the dead time individually selectable for each AR operation	Yes/No	Yes
	i. Number of sequential tripping operations to lockout		4



	ii. Electrical Endurance (in/out operations)		Complying to E3	
	iii. Mechanical Endurance(in/out operations)		Complying to M2	
	iv. Whether a counter is provided for recording electrical & mechanical operations.	Yes/No	Yes	
16.	Whether the current/voltage measuring facilities is provided for data logging purposes	Yes/No	Yes	
17.	Temperature rise for			
	i. Contact	°C		
	ii. Terminals	°C		
18.	Battery Supply			
	i. Type of Battery			
	ii. Whether it is sealed and maintenance free	Yes/No	Yes	
	iii. Service life time	years	4	
	iv. Number of in/out operation that could be performed w/o Mains supply	Nos		
	v. Whether documents including calculations furnished to prove of the above	Yes/No		
	vi. Whether a signal to indicate low battery voltage is provided	Yes/No		
	vii. Battery hold-up time	Hrs		
	viii. Method of obtaining Auxiliary supply for Battery charging			
	ix. Auxiliary battery Charging power supply voltage.			
19.	CT Ratio			
20.	Secondary Amps of the CT	Amp		
21.	Secondary voltage of the VT	Volts		
22.	Type of Bushing			
23.	Total creepage distance	mm		
24.	Type of terminal and the applicable conductor size			
25.	Material of;			
	i. Interrupter housing			
	ii. Control unit housing			
	iii. Operating mechanism housing			
26.	Protection category (IP) of Control cabinet		IP 54	
27.	Whether the following accessories are provided;			
	i. Pole steel mounting bracket(s)	Yes/No		
	ii. Surge arrester mounting brackets on source and load side of Auto-Recloser	Yes/No		
	iii. The galvanizing thickness	µm		
	iv. Powder coating thickness	µm		
	v. Lifting tackle	Yes/No		
	vi. Earthing terminal provided	Yes/No		
	vii. Applicable earth conductor size	mm		
	viii. Rating plate as per Clause 10.1	Yes/No		
28.	Whether for SF ₆ Equipment the following SF ₆ gas pressure sensors provided			
	i. Electronic			
	ii. Mechanical			
29.	Whether for SF ₆ Equipment the SF ₆ gas pressure sensors provided;			



	i. Indication	Yes/No	Yes	
	ii. All operation locked out	Yes/No	Yes	
30.	Whether signals and controls from SCADA comply with clause 5.4.1?	Yes/No	Yes	
31.	Whether user programmable logic controls comply with clause 5.4.2?	Yes/No	Yes	
32.	Whether communication module comply with clause 5.5?	Yes/No	Yes	
33.	Whether the provision to prevent explosion during internal arc fault provided?	Yes/No	Yes	
34.	Whether the provision for checking the remaining contact life of the interrupter available?	Yes/No	Yes	
35.	Whether a warning signal will be indicated when the remaining contact life of any phase reaches zero?	Yes/No	Yes	
36.	Whether the Software for programming the operations of the AR is provided?	Yes/No	Yes	
37.	Whether a controller with an integral RTU provided for remote control and communication functions	Yes/No	Yes	
	i. The type of the communication protocol conforms to IEC 870-5-101 & 104	Yes/No	Yes	
	ii. RTU allow remote control of all analogue and digital alarms and control points	Yes/No	Yes	
	iii. GSM/GPRS/3G Compatibility?	Yes/No	Yes	
	iv. Type of Interface from controller to RTU			
38.	Whether the Tools are provided (if required) if so the quantity	Yes/No	Yes	
39.	Whether all information provided as per clause 7.0	Yes/No	Yes	
40.	Place of testing, if outside the place of manufacture			

.....
Signature of the Manufacturer and seal

.....
Date

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

.....
Signature of the Bidder and seal

.....
Date



ANNEX- B2

SCHEDULE OF TECHNICAL REQUIREMENTS AND GUARANTEED TECHNICAL PARTICULARS
(CEB Requirements shall be filled by the procurement entity and information of the offer shall be filled by the manufacturer)

LBS with Sectionalizing Facility

		CEB Requirement	Offered
1.	Name of the Manufacturer		
2.	Country of Origin		
3.	Class Designation (Catalogue ref. No.)		
4.	Mounting (Single pole/double pole/gantry structure)		
5.	Type		
	i. Indoor/out door	Outdoor	
	ii. Insulation media (Solid/SF ₆)	Solid/SF ₆	
	iii. Interruption media (Vacuum/SF ₆)	Vacuum/SF ₆	
6.	Hermetically sealed	Yes/No	Yes
7.	Rated voltage	kV	
8.	Rated continuous Current	A	400
9.	Rated frequency	Hz	50
10.	Rated Short Circuit		
	i. Symmetrical interrupting current (rms)	kA	As per clause 5.3
	ii. Asymmetrical interrupting current (rms)	kA	
	iii. Making Current (peak)	kA	
11.	X/R ratio		
12.	Short time withstand current (1 second)	kA	As per clause 5.3
13.	Insulation level		
	i. Impulse withstand voltage (1.2/50 μ s) kV peak	kV	As per clause 5.3
	ii. Power frequency withstand voltage wet (1min.)	kV	
14.	Type of Operating mechanism		
15.	Mechanical & Electrical Endurances		
	i. Electrical Endurance (in/out operations)		Complying to E3
	ii. Mechanical Endurance(in/out operations)		Complying to M2
	iii. Whether a counter is provided for recording electrical & mechanical operations.	Yes/No	Yes
16.	Service life No. opening operations at;		
	(i) Full rated load		
	(ii) Half rated load		
17.	Temperature rise for		
	i. Contact	°C	
	ii. Terminals	°C	
18.	Battery Supply		
	i. Type of Battery		
	ii. Whether it is sealed and maintenance free	Yes/No	Yes
	iii. Service life time	years	4



	iv.	Number of in/out operation that could be performed w/o Mains supply	Nos		
	v.	Whether documents including calculations furnished to prove of the above	Yes/No		
	vi.	Whether a signal to indicate low battery voltage is provided	Yes/No		
	vii.	Battery hold-up time	Hrs		
	viii.	Method of obtaining Auxiliary supply for Battery charging			
	ix.	Auxiliary battery Charging power supply voltage.			
19.		CT Ratio			
20.		Secondary Amps of the CT	Amp		
22.		Type of Bushing			
23.		Total creepage distance	mm		
24.		Type of terminal and the applicable conductor size			
25.		Material of;			
	i.	Interrupter housing			
	ii.	Control unit housing			
	iii.	Operating mechanism housing			
26.		Protection category (IP) of Control cabinet		IP 54	
27.		Whether the following accessories are provided;			
	i.	Pole steel mounting bracket(s)	Yes/No		
	ii.	Surge arrester mounting brackets on source and load side	Yes/No		
	iii.	The galvanizing thickness	µm		
	iv.	Powder coating thickness	µm		
	v.	Lifting tackle	Yes/No		
	vi.	Earthing terminal provided	Yes/No		
	vii.	Applicable earth conductor size	mm		
	viii.	Rating plate as per Clause 10.1	Yes/No		
28.		Whether for SF ₆ Equipment the following SF ₆ gas pressure sensors provided			
	i.	Electronic			
	ii.	Mechanical			
29.		Whether for SF ₆ Equipment the SF ₆ gas pressure sensors provided;			
	i.	Indication	Yes/No	Yes	
	ii.	All operation locked out	Yes/No	Yes	
30.		Whether signals and controls from SCADA comply with clause 5.4.1?	Yes/No	Yes	
31.		Whether user programmable logic controls (for sectionalizing facility) comply with clause 5.4.2?	Yes/No	Yes	
32.		Whether communication module comply with clause 5.5?	Yes/No	Yes	
33.		Whether the provision to prevent explosion during internal arc fault provided	Yes/No	Yes	
34.		Whether the provision for checking the remaining contact life of the interrupter available	Yes/No	Yes	
35.		Whether a warning signal will be indicated when the remaining contact life of any phase reaches zero	Yes/No	Yes	
36.		Whether the Software for programming the operations of the LBS-SF is provided	Yes/No	Yes	



37.	Whether a controller with an integral RTU provided for remote control and communication functions	Yes/No	Yes	
	v. The type of the communication protocol conforms to IEC 870-5-101 & 104	Yes/No	Yes	
	vi. RTU allow remote control of all analogue and digital alarms and control points	Yes/No	Yes	
	vii. GSM/GPRS/3G Compatibility?	Yes/No	Yes	
	viii. Type of Interface from controller to RTU			
38.	Whether the Tools are provided (if required) if so the quantity	Yes/No	Yes	
39.	Whether all information provided as per clause 7.0	Yes/No	Yes	
40.	Place of testing, if outside the place of manufacture			

.....
Signature of the Manufacturer and seal

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Date

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

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Signature of the Bidder and seal

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Date



Annex – C

Non-Compliance Schedule

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

Clause No.	Non-Compliance

.....
Signature of the Manufacturer

.....
Date

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

.....
Signature of the Bidder and seal

.....
Date

