30-SDMS-04

Rev.0

SPECIFICATION FOR POLE-MOUNTED SF_6 INSULATED LOAD-BREAK SWITCHES FOR 13.8KV AND 33KV OVERHEAD DISTRIBUTION NETWORK

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1 Scope

This specification defines the minimum technical requirements for design, engineering, manufacturing, testing, inspection and performance of pole-mounted SF_6 insulated load-break switches (LBS) intended to be used in 13.8kV and 33kV medium-voltage overhead line distribution network of Saudi Electricity Company (SEC) in Saudi Arabia.

2 Cross References to Other SEC Standards

This specification shall always be read in conjunction with SEC General Specification No. 01-SDMS-01 (latest revision) titled "General Requirements for all Equipment/Materials", which shall be considered as an integral part of this specification. It shall also be read in conjunction with SEC purchase order and/or contract schedules, and scope of work/technical specifications for projects, as applicable.

The latest revisions of the following specifications shall be applicable for the equipment/material covered in this specification:

Specification#	Title
20-SDMS-01	Specification for Octagonal Steel Poles
20-SDMS-02	Specification for Overhead Line Accessories
20-SDMS-03	Specification for Pre-Stressed Spun Concrete Poles

Table 1: Reference SEC specifications

3 Applicable Codes and Standards

The latest revision of the following codes and standards shall be applicable for the equipment/materials covered in this specification. In case of any deviation, the vendor/manufacturer may propose equipment/materials conforming to alternate codes or standards. However, the provisions of SEC standards shall supersede the provisions of these alternate standards in case of any difference.

Standard #	Title
IEC 60060	High-Voltage Test Techniques
IEC 62271-1	High-Voltage Switchgear and Controlgear – Part 1: Common Specifications for Alternating Current Switchgear and Controlgear
IEC 62271-4	High-Voltage Switchgear and Controlgear – Part 4: Handling Procedures for Sulphur Hexaflouride (SF_6) and its Mixtures
IEC 62271-102	High-Voltage Switchgear and Controlgear – Part 102: Alternating Current Disconnectors and Earthing Switches
IEC 62271-103	High-Voltage Switchgear and Controlgear – Part 103: Switches for Rated Voltages Above 1kV up to and Including 52kV
IEC 60376	Specification of Technical Grade Sulphur Hexaflouride (SF_6) and Complementary Gases to be Used in its Mixtures for Use in Electrical Equipment
IEC 60480	Guidelines for the Checking and Treatment of Sulphur Hexaflouride (SF_6) Taken from Electrical Equipment and Specification for its Re-Use
IEC 60068-2-17	Basic Environmental Testing Procedures – Part 2: Tests – Test Q: Sealing
IEC 62217	Polymeric HV Insulators for Indoor and Outdoor Use – General Definitions, Test

	Methods and Acceptance Criteria
IEC TS 60815-3	Selection and Dimensioning of High-Voltage Insulators Intended for Use in Polluted Conditions – Part 3: Polymer Insulators for AC Systems
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings of Iron and Steel Products
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM B545	Standard Specification for Electrodeposited Coatings of Tin
ANSI C119.4	Electric Connectors – Connectors for Use Between Aluminum-to-Aluminum and Aluminum-to-Copper Conductors Designed for Normal Operation at or Below 93°C and Copper-to-Copper for Normal Operation at or Below 100°C
NEMA CC1	Electric Power Connection for Substations

Table 2: List of applicable standards

4 Service and System Conditions

The LBS and all of its associated components shall be suitable for operation under the service conditions specified in the latest revision of SEC specification 01-SDMS-01.

All fittings and attachments of the LBS shall be capable of withstanding the effects of direct solar radiation at their installed locations. The temperature of surfaces exposed to direct solar radiation shall be regarded as 75°C plus the effect of any internal heating.

5 Material, Design and Construction Requirements

5.1 General

5.1.1 The LBS and its associated components shall meet or exceed the requirements of this specification in all respects, and it shall be manufactured and tested in conformance with relevant international standards.

5.1.2 The LBS shall be capable of switching load currents with full recovery voltage across the switch and interrupting transformer magnetizing current and overhead line charging current. This shall permit all switching to be done live such as disconnecting/connecting tie lines/paralleling of feeders.

5.1.3 Manufacturer's drawing shall show the outline of the LBS together with all pertinent dimensions of its associated components and pole-mounting accessories. Any variations in these dimensions due to manufacturing tolerances shall also be indicated.

5.1.4 The rated continuous currents of the LBS are 400A and 600A respectively for both 13.8kV and 33kV system voltages.

5.1.5 The basic insulation levels for 13.8kV and 33kV systems are as specified in Table 6 of the latest revision of 01-SDMS-01.

5.1.6 The rated short-time withstand currents for a duration of 1 second are 21kA for 13.8kV and 25kA for 33kV.

5.1.7 The creepage distances are based on the nominal line-to-line voltage intended for outdoor installation as specified in Table 4 of the latest revision of 01-SDMS-01.

5.2 Arc Extinguishing and Insulating Medium

The arc extinguishing and insulating medium of the LBS shall be SF_6 gas complying with the requirements of the latest edition of IEC 60376.

5.3 Tank

5.3.1 A hermetically sealed SF_6 gas filled stainless steel tank with minimum thickness of 3.0mm shall be provided. The sealed pressure system of the tank shall be suitable for a service life of not less than 30 years.

5.3.2 Gas tightness of the closed pressure systems shall conform to the requirements of IEC 62271-1 Clause 6.16.3.

5.3.3 The tank shall be provided with a pressure-relief device to prevent fragmentation in case of over-pressure. The vent should be directed away from the operator.

5.3.4 The gas-filling valve shall be protected using a gas-tight threaded cap.

5.3.5 The tank walls shall be designed to be mechanically rigid to prevent distortion when lifted and mounted.

5.4 Low Gas Pressure Indicator/Lock-Out

The LBS shall be fitted with a pressure indicating and lock-out device which shall:

5.4.1 Indicate when an unsafe low SF_6 gas pressure is reached.

5.4.2 Automatically lock-out the LBS to prevent further operations if the SF_6 gas pressure falls to a level where any further loss of pressure will reduce the insulation levels of the LBS below the system maximum voltage.

5.5 Mounting

5.5.1 The LBS shall be suitable for pole mounting.

5.5.2 Pole mounting brackets, clamps, and fasteners for the LBS and its associated auxiliaries, if any, shall be provided. Mounting brackets and clamps should

accommodate the use of either 13 meter length octagonal steel or pre-stressed spun concrete poles conforming on the latest revisions of SEC specification 20-SDMS-01 and 20-SDMS-03, respectively.

5.6 Lifting Lugs

The LBS shall be provided with adequately rated lifting lugs permanently attached and positioned on the tank to provide a distributed/balanced vertical lift on the completely assembled unit with surge arresters fitted. The minimum diameter of the lifting eyes shall be 30mmØ.

5.7 Surge Arrester Mounting-Brackets

Surge arrester brackets suitable for mounting of surge arresters adjacent to each bushing on the load-side and source-side shall be provided. An M12 size hole shall be drilled on the brackets for the arrester mounting.

5.8 Bushings

5.8.1 The LBS shall be fitted with polymer bushings conforming on the requirements of IEC 62217 and the latest amendments applied thereto.

5.8.2 Each bushing shall have a NEMA 2-hole terminal pad. M12 size stainless steel fasteners (bolts, nuts, lock washers, and serrated washers) Grade A2-70 shall be provided on the terminals of the bushings.

5.9 Operating Mechanism

5.9.1 The LBS shall be provided with lockable, manual, mid-pole mounted operating mechanism to enable it to be operated from the ground level by using a standard lineman hot-stick.

5.9.2 The opening/closing operations shall be spring-assisted so that the speed of operations is completely independent of the operator's effort.

5.9.3 Provision for locking the operating mechanism on the "ON" and "OFF" positions shall also be provided.

5.9.4 Visually clear and unambiguous position indicator shall be provided to an operator standing on the ground. The indicator shall be mechanically linked to the switching mechanism and is clearly visible to an observer 10m away from the LBS. Symbols and colors for the indicator shall be RED "1" or "ON"

for ON and GREEN "0" or "OFF" for OFF. The supplier/manufacturer shall guarantee that the indicator colors shall remain vivid for the LBS working life.

5.9.5 The operating mechanism of the LBS shall be upgrade-ready for automation by connecting it via control cable with a standard military-grade plugin connector to a control panel equipped with SEC specified RTU. The automation and communication requirements shall comply with latest requirements of SEC Distribution IT Systems & Automation Department.

5.10 Vibration and Impact

The LBS shall be provided with safety feature to prevent mal-operations due to gravity, vibrations, electromagnetic forces, excessive tilt, or shocks caused by vehicular collision on the pole structure to where the LBS is mounted. Design details including proving tests undertaken to comply this requirement shall be submitted in the tender offers.

5.11 Earthing

5.11.1 Provision shall be made to ensure electrical continuity of all exposed metal.

5.11.2 The LBS including the mid-pole mounted operating mechanism shall be provided with M12 stainless steel earthing studs with stainless steel nut, serrated washer and lock-nut.

5.12 Protection Against Corrosion

5.12.1 The stainless steel tank per Clause 5.3 shall be painted or powder coated to ensure a maintenance-free service life of 30 years under the environmental conditions of Saudi Arabia.

5.12.2 All current carrying parts of the LBS shall be made of high conductivity corrosion-resistant metal, and those that are exposed in the environment shall be electrolytically bright tin-coated in accordance with ASTM B545 with minimum thickness of 5µm.

5.12.3 All ferrous parts of the LBS like mounting brackets, clamps, fasteners other than stainless steel shall be galvanized in conformance with the latest requirements of 01-SDMS-01 Clause 5.1.

5.13 Markings and Nameplate

5.13.1 The LBS shall be provided with stainless steel nameplate with the information engraved or laser etched and is guaranteed to remain readable throughout the product working life.

5.13.2 Nameplate information includes, but not limited to:

5.13.2.1 Manufacturer's Name or Logo
5.13.2.2 Product Model/Type
5.13.2.3 Rated Voltage
5.13.2.4 Rated Continuous Current
5.13.2.5 Rated Short-Circuit Withstand and Duration
5.13.2.6 Rated Frequency
5.13.2.7 Serial Number
5.13.2.8 Year and Month of Manufacture
5.13.2.9 Country of Origin
5.13.2.10 SEC Issued PO Number
5.13.2.11 Vendor Name
5.13.2.12 Reference SEC Specification
5.13.2.13 SEC Item Code
5.13.2.14 SEC Monogram
5.13.2.15 "Property of SEC"

5.13.3 Phase identification of the source-side and load-side bushings shall be labeled as U - V - W and R - S - T, respectively using an indelible black paint of size readable from the ground level. Phase identification using adhesive stickers is not acceptable.

6 Testing and Inspection

The load-break switches shall be tested in conformance with the applicable requirements of IEC 62271-103 and IEC 62271-1.

6.1 Type Test

6.1.1 The LBS shall be type tested in conformance with the applicable clauses of IEC 62271-103 and IEC 62271-1.

6.1.2 The bushings fitted on the LBS shall be type tested in conformance with the requirements of IEC 62217.

6.1.3 Type test shall be performed at SEC approved laboratory.

6.1.4 SEC reserves the right to attend and witness the tests.

6.1.5 SEC reserves the right to request the supplier/manufacturer to repeat the type test every five (5) years, or as needed should the supplied LBS have frequent faults and failures.

6.2 Routine Test

6.2.1 Routine tests in conformance with the applicable clauses of IEC 62271-103 and IEC 62271-1 shall be performed on all LBS unit.

6.2.2 Prior to issuance of releases of each batch quantities to be delivered, electronic copies of the routine test reports of each unit shall be submitted to SEC in USB thumb drive for review and approval.

6.2.3 SEC reserves the right to attend and witness the routine tests at the manufacturer's facilities.

6.3 Sample Inspection

Sample together with the as-built drawings, user manuals, electrical schematics, specifications of each component of the LBS unit, routine test reports, and packaging details shall be subject for inspection/evaluation prior to issuance of approval for mass production. Sample inspection/evaluation shall be conducted at either supplier's or manufacturer's facilities, whichever SEC advises. The following attributes shall be checked:

6.3.1 Feature and components' compliance verification
6.3.2 Markings
6.3.3 Manuals, drawings, and schematics
6.3.4 Pole mounting accessories and other auxiliaries
6.3.5 Packaging
6.3.6 Functionality

7 Packing and Shipping

7.1 Packing and shipping requirement shall be generally conforming with the requirements of the latest revision of 01-SDMS-01 or as per purchase order requirements.

7.2 Each LBS shall be packed in a sea-worthy crates as a complete unit and shall be delivered ready for use.

7.3 Packing shall protect the LBS unit against damage during shipment and site handling.

7.4 Supplier/manufacturer should coordinate with SEC Materials Management Department for additional packing, handling, and or shipping instructions, as applicable.

8 Guarantee

The supplier/manufacturer shall guarantee the LBS unit against all defects arising out of faulty design or manufacturing defects or defective materials for a period of five (5) years from the date of delivery.

In case of SF_6 gas-leak within the guaranteed service life of the LBS, all expenses for the maintenance, SF_6 gas re-filling, repairs, and replacements shall be borne by the supplier/manufacturer.

The supplier/manufacturer shall guarantee the uniformity of each LBS unit with the approved sample and drawings.

9 Submittals

9.1 Submittals Required with Tender/Inquiry

9.1.1 Summary in table form with the following information: list of items offered, B.O.Q. for each unit offered, manufacturer, origin, catalogue number, and quantity

9.1.2 Clause-by-clause compliance with the latest revision of SEC specification 30-SDMS-04

9.1.3 Manufacturer's Catalogue, Operation and Maintenance Manual, Lifting and Handling Instructions, Electrical Schematics

9.1.4 Certificate stating that the material/components has been sampled, tested and inspected in accordance with relevant standard specifications, as applicable

9.1.5 Product type test reports and certificates carried out from SEC approved laboratories

9.1.6 Filled-up technical data schedule on each of the items offered, e-copy in Excel (*.xlsx) format

9.1.7 Manufacturer CAD drawings, e-copy in AutoCAD 2013 (*.dwg) format, for each of the LBS units and its components and other auxiliaries

9.1.8 USB Flash Drive containing e-copy of all the documents mentioned above

9.2 Submittals Required Following Award of Contract

9.2.1 Fabrication CAD drawings

9.2.2 Quality assurance tests

9.2.3 Manufacturing and routine test schedules

9.2.4 Special tests, if applicable

9.2.5 USB Flash Drive containing e-copy of all the documents mentioned above

10 Technical Data Schedule

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
1	**General**	-	
	Reference Manufacturing Standard (LBS)	IEC 62271-1 IEC 62271-103	
2	**Design Requirements**	-	
	Rated Voltage	17.5kV / 38kV	
	Rated Insulation Level - Impulse Withstand Voltage (Peak), kV - Power Frequency Withstand Voltage, kV_{rms} (Dry/Wet)	As per 01-SDMS-01	
	Rated Frequency	60Hz	
	Rated Continuous Current	400A / 600A	
	Rated Short-Time Withstand Current for 1 Second	21kA / 25kA	
	Rated Mainly Active Load-Breaking Current	400A / 600A	
	Rated Peak Withstand Current, kA	**	
	Rated Short-Circuit Making Current, kA	**	
	Creepage Distance, mm/kV	25 / 40	
3	**Bushings (Polymer Insulators)**		
	Reference Manufacturing Standard	IEC 62217	
	Material / Color	Polymer / Grey	
4	**Accessories**		
	Pole Mounting Accessories Provided	Yes	
	All Ferrous Components are Hot-Dip Galvanized	Yes	
5	**Others**	-	
	Product is Type Tested	Yes	
	SEC Approved Laboratory	**	
	Date Tested	**	
	Manufacturer	**	
	Model/Type	**	
	Country of Origin	**	
	Submittals Required with Tender/Inquiry Included or Not?	**	

Table 3: Technical Data Schedule

Pole-Mounted SF_6 Insulated Load-Break Switch

SEC Inquiry No: _____ Item No: _____

- Additional Technical Information or Features Specified by SEC
- Additional Supplementary Data or Features Proposed by Bidder/Vendor/Supplier.
- Other Particulars to be filled-up by the Bidder/Vendor/Supplier.
- List of Deviations and Clauses to which exception is taken by the Bidder/Vendor/Supplier. (Use separate sheet, if necessary).

Description	Manufacturer of Material/Equipment	Vendor/Supplier
Name of Company		
Location and Office Address		
Name and Signature of Authorized Representative with Date		
Official Seal / Stamp		