KINGDOM OF CAMBODIA

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ELECTRICITE DU CAMBODGE

TECHNICAL SPECIFICATION

EDC-DTS-MV007

Line Post Insulators

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Line Post Insulators

1 Scope

This specification covers the design, manufacturing, testing, supply, delivery and performance requirements of 35 kV and 22 kV line post insulators and accessories to be used on MV distribution systems of Electricité du Cambodge.

2 Standards

The equipment shall comply with the latest editions of the amendments to the standards/specifications listed below:

IEC International Electro-technical Commission

- IEC 60168 :Test on Indoor and Outdoor Post Insulators
- IEC 60273 :Characteristics of Indoor and Outdoor Post Insulator >1000 V
- IEC 60383 :Insulators for Overhead Lines with a Nominal Voltage above 1000 V
- IEC 60720 :Characteristics of Line Post Insulators

ISO : International Standard Organization

- ISO 2063 : Metallic coating-protection of iron and steel against corrosion
- ISO/IEC 17025 : General requirements for the competence of testing and calibration laboratories
- ISO 9001 : Quality management systems – Requirements

The Supplier may propose alternative standards, provided it is demonstrated that the standards give an equivalent degree of quality as the referenced ones. Acceptability of any alternative standard is at the discretion of EDC.

3 Definitions

The definition of the relevant IEC standards apply to this technical specification.

4 Testing and inspection

4.1 General Notes for Test

Line post insulators may be inspected at the manufacturer's factory by EDC's representatives.

The inspection and routine tests shall be carried out in accordance with the provisions of the relevant IEC recommendations.

The line post insulators shall be subjected to test as specified below.

4.2 Type Tests

All type tests required by the relevant IEC shall be carried out.

Type test reports shall be carried out by internationally recognized electrical testing laboratories.

Full copies of type test reports shall be submitted within the bid of the manufacturer/supplier. Type test reports older than 10 years will not be accepted.

If the manufacturer is certified by EDC, it is not necessary to submit type test reports for the considered equipment.

The list of already EDC certified manufacturers is provided in Annex 1.

Nevertheless, in case the testing laboratory is not internationally recognized, the testing laboratory shall be mandatorily accredited ISO/IEC 17025 by an international or national accreditation body specialized in testing laboratories accreditation/acceptance. In that case, the testing laboratory shall prove mandatorily its capability/capacity to carry out all type tests mentioned in the type tests reports by suppling: Full description of all tests the laboratory can carry out, list of testing equipment with full characteristics, drawing of testing rooms with location of testing equipment, ...etc., supported by pictures and copy of the ISO/IEC 17025 accreditation certificate.

Acceptability of any accredited testing laboratory is at the discretion of the EDC.

4.3 Routine Test

These tests shall be carried out on each insulator to be supplied, at the manufacturer's factory to ensure that the product is in accordance with the insulator on which the type test has been carried out.

The manufacturer shall, if requested, supply a certificate giving the result of all the tests carried out on the insulator.

The tests shall include:

- Visual Inspection Tests

All insulators shall be subjected to visual inspection in accordance with IEC 60383.

- Mechanical Strength Tests (tension proof test)
- Electrical Tests

All porcelain insulators shall be subjected to routine flash-over test.

Routine test reports shall be sent to EDC prior the shipment for EDC acceptance.

4.4 Acceptance Test

These tests shall be applied on insulators to be supplied, selected at random from the lot by EDC or by EDC representative.

The sizes of samples are indicated in the table below:

Lot Size	Sample Size	
Number (N)	**X**	**Y**
Below N < 2 000	4	3
2 000 < N < 5 000	8	4
5 000 < N < 10 000	12	6

When more than 10 000 insulators are concerned they shall be divided into an optimum number of equal lots comprising between 2 000 and 10 000 insulators. The result of the tests shall be evaluated separately for each lot.

The acceptance test procedure for any delivery of the insulators shall include:

- Verification of the Dimensions

Insulators shall be selected at random from the lot and their dimensions checked against the dimensions on the manufacturer's drawings.

- Temperature Cycle Test (porcelain insulator only)

Porcelain insulators shall be selected at random from the lot.

- Galvanizing Test

Representative of each type galvanized hardware used with insulator shall be selected at random and tested either by magnetic method, gravimetric method or by microscopic method.

In the event of a failure of the sample to satisfy a test, the retesting procedure shall be as follows:

If only one insulator or metal part fails to comply with the sampling tests, a new sample equal to twice the quantity originally submitted to the tests shall be subjected to retesting. The retesting shall comprise the test in which failure occurs. If two or more insulator or metal parts fail to comply with any of the sampling tests or if any failure occurs during the retesting, the complete lot is considered as not complying with this standard and shall be withdrawn by the manufacturer.

Provided the cause of the failure can be clearly identified, the manufacturer may sort the lot to eliminate all the insulators with these defects. The sorted lot then be resubmitted for testing. The number then selected shall be three times the first chosen quantity for tests. If any insulators fail during this retesting, the complete lot is considered as not complying with this standard and shall be withdrawn by the manufacturer.

5 Quality Management

Design, development and production of the proposed equipment shall be ISO 9001 certified. The ISO 9001 certificate shall be submitted within the bid.

6 Design

This specification covers porcelain type line post insulators for use on supporting structures with poles for MV overhead distribution systems.

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6.1 Ambient Conditions

The insulators shall be suitable to operate in the ambient conditions described here after:

Altitude	Sea level to 1,000 meters
Climate	Tropical
Annual Rainfall	1,300 mm.140 days
Monsoon Period	June to November
Ambient Air Temperatures:	
Average	27.5°C
Minimum	13.3°C
Maximum	40.5°C
Relative Air Humidity	65-100%
Soil Thermal Resistivity:	
Average	1.20 cm/W
Maximum	3.00 cm/W
Solar Emissivity	0.8
Solar absorption	0.8
Wind Velocity:	
Average	37 km/h (10.3 m/s)
Maximum	72 km/h (20 m/s)

6.2 Design and Construction

The insulator material shall be made of brown glazed porcelain.

The insulator surface, except for places where metal pins will be fixed, shall be covered with an event ceramic layer. The ceramic surface shall be shining, with no evident ripples, no cracks and no wrinkles.

The insulators shall have no cracks, scratches, pock and shall not be under burnt.

The insulator and associated bolts, nuts and washings shall be hot-dip galvanized. The coating thickness shall not be less than eighty five (85) µm. The insulators and the stud are connected by threads. The thread length and the stud size shall ensure the insulator mechanical breaking strength at bending. All insulator units offered shall comply with the characteristics and performance requirements set down in the following table:

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Characteristics	Requirements	
Electrical	35 kV system	22 kV system
Rated maximum voltage (Um)	38 kV	24 kV
Impulse withstand voltage (dry) (1.25/50µs)	200 kV minimum	125 kV minimum
Dry 50Hz withstand voltage (1 min)	110 kV minimum	90 kV minimum
Wet 50Hz withstand voltage (1 min)	100 kV minimum	85 kV minimum
Mechanical		
Cantilever Mechanical failing load	12.5 kN minimum	12.5 kN minimum
Dimension		
Minimum Creepage distance: (1) Pollution level II area (medium): 20 mm/kV Pollution level III area (heavy): 25 mm/kV	 760 mm 950 mm	 480 mm 600 mm
Assembling	M20	M20
Color	Brown	Brown

(1) Pollution level III area: Coastal band of 10 km large. Pollution level II area: rest of Cambodia.

The insulator shall be suitable for various bare and covered conductors size up to 240 mm².

The neck and groove dimensions shall be Standard Head as in IEC 60720. Insulator assemblies shall be complete with M20 stud, M20 nut, lock nut and washer to suit the steel cross-arms. The mounting stud length shall be minimum 125 mm and maximum 130 mm, suitable for mounting on 75 x 38 and 100 x 50 steel channel cross arms. The thread length shall be not less than 100 mm.

The relevant vertical dimensions of the insulator shall be such that when combined with bolt insulator, the design requirement for conductor clearance from the cross-arm at 35 kV or 22 kV shall be met.

The side (neck) and top grooves shall have a semi-conducting glaze to reduce radio interference.

The design shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. Precautions shall be taken to prevent chemical reaction between cement and metal fittings, for instance, by the choice of suitable materials or by the method of construction.

The insulating material shall not engage directly with hard metal. Cement used in the construction of the insulator shall not cause fracture by expansion or loosening by contraction and proper care shall be taken to locate the individual parts correctly during cementing.

6.3 Accessories

Each insulator shall be supplied complete with a hot dip galvanized stud, with nut, lock nut, flat and elastic washer. The zinc coating thickness shall not be less than eighty five (85) µm.

The stud shall be suitable for cross arms and fittings used in this Project. The ultimate strength of the pin insulator assembly shall be equal to the under-mentioned mechanical failing load.

6.4 Dimensions

The line post insulator shall have dimensions according to IEC 60720. The mounting stud shall be M20, minimum stud length 150 mm and maximum stud length 180 mm, the stud thread length shall be a minimum length of 100 mm.

EDC has already standardized 22 kV insulators. So in order to avoid changes in sagging and conductor ground clearance when replacing broken insulators later, the dimensions of the 22 kV line post insulators only shall be as follow:

- Diameter: 150 mm ± 20mm
- Height: 305 mm ± 25mm

The supplier shall guarantee that the dimensions and tolerances of the insulators offered are in accordance with his detailed drawing which shall accompany his quotation.

6.5 Markings

The insulating part shall be clearly and permanently marked with the name of the manufacturer or trade mark, year of manufacture and lightning impulse voltage according to the table above and cantilever load.

7 Technical Data Sheets

7.1 35 kV Line Post Insulator

No	Description	Unit	Requirements	Supplier's Offer
	35 kV Line Post Insulator			
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's Reference		to be specified	
4	Applicable Standard Specification		to be specified	
5	Dry impulse withstand test (1.2/50 µs)	kV	200	
6	Dry, 50Hz, 1 minute, withstand test	kV	110	
7	Wet, 50Hz 1 minute, withstand test	KV	100	
8	Dry, critical impulse flash-over voltage	kV	to be specified	
9	Dry, 50Hz, critical flash-over voltage	kV	to be specified	
10	Safe working load	kN	to be specified	
11	Cantilever Mechanical failing load	kN	≥ 12.5	
12 a	Creepage distance (20 mm/kV minimum)	mm	≥ 760	
12 b	Creepage distance (25 mm/kV minimum)	mm	≥ 950	
13	Maximum radio influence voltage	µV	to be specified	
14	Type of material			
	*Insulator		Porcelain	
	*Cement		to be specified	
15	Type of semi-conducting glaze		to be specified	
16	Radius of conductor groove		to be specified	
17	Identification markings		to be specified	
18	Suitable for AAC and covered conductors up to 240 mm²		Yes	
19	Color of insulator		Brown	
20	Weight of insulator	kg	to be specified	
21	Diameter	mm	to be specified	
22	Height	mm	to be specified	

23	Threaded part of insulator		M20	
24	Composition of stud		To be specified	
Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , etc..." are not accepted.				

Deviation from the technical specification:

The bidder shall list point after point and explain here in after all deviation from the requested technical specification.

1/

2/

3/

x/

Full technical information shall be supplied within the bid.

Bidder signature:

7.2 22 kV Line Post Insulator

No	Description	Unit	Requirements	Supplier's Offer
	22 kV Line post Insulator			
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's Reference		to be specified	
4	Applicable Standard Specification		to be specified	
5	Dry impulse withstand test (1.2/50 µs)	kV	125	
6	Dry, 50Hz, 1 minute, withstand test	kV	90	
7	Wet, 50Hz 1 minute, withstand test	KV	85	
8	Dry, critical impulse flash-over voltage	kV	to be specified	
9	Dry, 50Hz, critical flash-over voltage	kV	to be specified	
10	Safe working load	kN	to be specified	
11	Cantilever Mechanical failing load	kN	≥12.5	
12a	Creepage distance (20 mm/kV minimum)	mm	≥ 480	
12b	Creepage distance (25 mm/kV minimum)	mm	≥ 600	
13	Maximum radio influence voltage	µV	to be specified	
14	Type of material			
	*Insulator		Porcelain	
	*Cement		to be specified	
15	Type of semi-conducting glaze		to be specified	
16	Radius of conductor groove		to be specified	
17	Identification markings		to be specified	
18	Suitable for AAC and covered conductors up to 240 mm²		Yes	
19	Color of insulator		Brown	
20	Weight of insulator	kg	to be specified	
21	Diameter	mm	150 ± 20	
22	Height	mm	305 ± 25	
23	Threaded part of insulator		M20	
24	Composition of stud		To be specified	

Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , etc..." are not accepted.
Deviation from the technical specification: The bidder shall list point after point and explain here in after all deviation from the requested technical specification. 1/ 2/ 3/ x/ Full technical information shall be supplied within the bid. Bidder signature: