Saudi Electricity Company	الشركة السعودية للكهرباء

SEC DISTRIBUTION MATERIALS SPECIFICATION	15-SDMS-01
	DATE: 18-07-1423 H

15-SDMS-01

SPECIFICATION

FOR

OVERHEAD LINE PORCELAIN INSULATORS

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1.0 SCOPE

This SEC Distribution Materials Specification (SDMS) specifies the minimum technical requirement for design, materials, manufacturing, testing, and performance of the following porcelain insulators:

1.1 Low voltage spool type insulators
1.2 13.8 & 33 KV Line post type insulators
1.3 13.8 & 33 KV Suspension (Disc) type insulators
1.4 13.8 & 33 KV Stand off post type insulators

These insulators are intended to be used in the overhead line distribution system of the Saudi Electricity Company (SEC).

2.0 CROSS REFERENCES

2.1 This SDMS shall always be read in conjunction with SEC General Specification No. 01-SDMS-01 (Latest Revision) titled General Requirement for all Equipment/Materials, which shall be considered as an integral part of this SDMS.

2.2 For service conditions/system parameters refer to SEC General Specification No. 01-SDMS-01 (Latest Revision).

2.3 This SDMS shall also be read in conjunction with SEC Purchase Order or Contract Schedules and the Scope of Work and Technical Specifications for project, as applicable.

3.0 APPLICABLE CODES AND STANDARDS

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

IEC	**International Electrotechnical Commission**
IEC 60168	Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000V.
IEC 60273	Characteristics of indoor and outdoor post insulators and post insulator units for systems with nominal voltages greater than 1000V.
IEC 60383	Tests on insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1000V.
IEC 60437	Radio interference test on high voltage insulators.
IEC 60471	Characteristics of clevis and tongue couplings of string insulator units.
IEC 60507	Artificial pollution tests on high voltage insulators to be used on AC systems.
IEC 60575	Thermal – Mechanical performance test and mechanical performance test on string insulator units.
IEC60720	Characteristics of line post insulators.

ANSI	**American National Standards Institute**
ANSI C29.1	Test methods for electrical power insulators.
ANSI C29.2	Wet process porcelain and toughened glass insulators-suspension type.
ANSI C29.3	Wet process porcelain insulators (Spool type).
ANSI C29.7	Wet process porcelain insulators (High voltage line- post type).

ANSI C29.9	Wet process porcelain insulators (Apparatus, post type).
ASTM	**American Society for Testing & Materials**
ASTM- A153	Standard specification for Zinc coating (Hot Dip) on iron and steel hardware.
ASTM-C151	Test method for Autoclave expansion of Portland cement.
BS	**British Standards Institute**
BS 137	Insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1000V.
BS 3288	Insulators and conductor fittings for overhead power lines (Parts 1 and 2).
BS 729	Galvanizing.

4.0 DESIGN AND CONSTRUCTION REQUIREMENTS

4.1 General

4.1.1 All types of the insulators shall meet or exceed the requirements of this specification in all respects and shall consist of a single piece of porcelain together with its metal parts to form a rigid assembly.

4.1.2 Manufacturer's drawings, as required in 01-SDMS-01, shall show the outline of the insulators together with all pertinent dimensions. Any variations in these dimensions due to manufacturing tolerances shall be indicated.

4.2 Design Criteria

4.2.1 Unless otherwise specified, the insulators shall be manufactured and tested in accordance with the relevant standards mentioned in clause no.3.

4.2.2 All types of insulators should be designed according to the system parameters and service conditions given in specification 01-SDMS-01.

4.2.3 All types of insulators shall have the mechanical , electrical and insulation class ratings as given in the technical data schedules of this SDMS.

4.2.4 The design shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to any deterioration. Precautions shall be taken to avoid chemical reaction between cement and material fitting.

4.2.5 Suspension insulators shall be Clevis type ANSI class 52-4.

4.2.6 Spool insulators shall be ANSI class 53-3.

4.2.7 The creepage distance shall be based on the following:
a. 25 mm/ 1 kV for Dry Areas (inland)
b. 40 mm/ 1 kV for Wet Areas (coastal)

4.2.8 Three types of Line post insulators shall be as follows:

- With total creepage distance 552 mm for 13.8 kV (Diameter of shed 152 mm and creepage distance is 40 mm/kv).

- With total creepage distance 825 mm for 33 kV (Diameter of shed 178 mm and creepage distance is 25mm/kv).

- With total creepage distance 1320 mm for 33kV (Diameter of shed 185mm (Min) and creepage distance is 40mm/kV).

4.3 Materials

4.3.1 The insulators shall be made of good commercial grade wet process porcelain.

4.3.2 The entire exposed porcelain surface of the insulators shall be standard glazed and shall be brown in color. The entire porcelain surface shall be smooth and free of imperfections.

4.3.3 The glazing of the porcelain shall be of A-Type to minimize radio interference (RIV) and corona discharge voltage.

4.3.4 Metal parts shall be made of a good commercial grade of malleable iron, ductile iron or steel, galvanized in accordance with specification 01-SDMS-01.

4.3.5 Portland cement shall be used as the bonding agent and for filling the gap between the porcelain and the metal parts. It must have high compressive strength to maintain the cantilever strength ratings of the insulators specified in the technical data schedule. Sulfur based cements are not acceptable.

4.4 Construction

4.4.1 The hardware shall be cemented on the porcelain with load distribution evenly throughout the porcelain. Before cementing, the hardware surface in contact with the cement shall be coated with bituminous compound.

4.4.2 The contours of the metal and porcelain parts shall be such as to eliminate areas of high electrical stress concentrations.

4.4.3 The insulator shall be of puncture proof porcelain constructions.

4.4.4 The insulator surface shall be shaped and spaced for effective natural cleaning and effective use of leakage distance for desert conditions.

4.4.5 The insulator shall be radio interference free at operating voltage.

4.4.6 All ferrous components except those made of stainless steel shall be galvanized.

4.4.7 Suspension insulator:

a. The axial, radial and angular displacements of the insulator and their verification shall be in accordance with IEC 60383.

b. To inhibit the accelerated corrosion of insulator pin due to leakage currents, a corrosion intercepting zinc sleeve fused to the pin shall be provided at the point where the steel pin emerges from the cement.

4.5 Mounting

4.5.1 Line Post Insulator

a. The line post insulator bottom and the stud shall be serrated to lock the stud against loosening due to line vibration as shown in drawings.

b. The stud for the line post insulator shall be hot- dip galvanized in accordance with appropriate industry standard and complete with nuts and washers for steel crossarm mounting. The size and dimensions are given in drawing.

4.5.2 Stand off Insulator

a. The base of the stand off insulator shall have ISO metric thread bolt holes on standard bolt circles for interchangeability and ease of mounting. Holes in top and bottom fittings shall be in line, and they shall be so arranged as to permit the use of standard hexagonal bolt heads and nuts.

b. The stand off insulator may be mounted either upright, horizontally or inverted positions.

4.6 Marking

4.6.1 Each insulator shall bear a marking as per ANSI or IEC Standards, Identifying the following (English):

a. Manufacturer name.
b. Year of manufacturing.
c. Designation number.
d. Cantilever strength (Combined M&E strength suspension insulator).
e. Country of origin.

4.6.2 Crate Marking (English and/or Arabic):

a. Nominal System voltage.
b. Type of insulator (Spool, Suspension, Line post and Stand off).
c. SEC purchase order number / contract number.
d. 15-SDMS-01, Rev. 0.
e. SEC Item number.
f. Weight, Kg.
g. Manufacturer name / Country of origin.

5.0 TESTING AND INSPECTION

All test results shall be provided for review and acceptance by SEC.

5.1 Type Tests

5.1.1 All type tests prescribed in the relevant IEC or equivalent ANSI standards shall be performed on the representative unit or on the first unit of every new design or rating to be supplied to SEC.

5.1.2 The certified test reports of type tests performed on a unit of identical design and rating may be submitted to SEC for review and approval during bidding stage.

5.1.3 In addition to the above IEC or ANSI type test requirements, the following type tests shall be carried out for suspension insulators:

a. Thermal–Mechanical performance test on suspension insulator units in accordance with IEC 60575.

b. Autoclave Expansion Test for Portland cement - The soundness of Portland cement to be used as the bonding agent for wet-process aluminous porcelain insulators shall be tested in accordance with the ASTM C151.

Ten (10) samples of cement for the test specimen shall be selected at random from the batch to be used for insulators. The bars prepared from neat cement when subjected to high pressure steam at 2 ± 0.07 Mpa for three hours at 216º C shall not show expansion of more than 0.12 percent.

The expansion of cement more than 0.12 percent in the test shall be the cause for rejection of the whole batch of cement.

5.2 Routine Tests

5.2.1 All routine tests prescribed in the relevant IEC or equivalent ANSI standards shall be performed on all units prior to delivery to SEC.

5.2.2 Electrical routine tests shall be carried out on each stand off insulator:

a. The ultrasonic test shall be performed on solid core and the puncture test shall be performed on hollow core porcelain insulators.

b. Routine flashover test shall also be performed on hollow core porcelain insulators.

5.3 Sample Tests

5.3.1 All samples relevant to IEC or equivalent ANSI standards shall be performed on all units prior to delivery to SEC.

5.3.2 In addition to the above IEC or ANSI sample test requirements, the following sample tests shall be carried out for suspension insulators:

a. A dimension test shall be performed on three strings of six insulators each selected at random and the connecting length of each string shall be 6 times the nominal spacing of the insulators with a tolerance of ± 19 mm.

b. Verification of axial, radial and angular displacement.

5.4 Special Tests

The pollution test, as an option shall be performed in accordance with IEC 60507, if requested by SEC prior to delivery.

5.5 Inspection

The SEC may wish to witness tests or visit the factory during manufacture of any or all Items covered by this specification. Accordingly the supplier shall be give the purchaser adequate notice of manufacturing program and test to be witnessed. SEC may require certificates and data from the manufacturer/supplier on all pertinent aspects of the manufacturing process. However for detailed inspection conditions refer to the latest revision of the SEC general specification No 01-SDMS-01, clause 7

6.0 PACKING AND SHIPMENT

In addition to the applicable items per 01-SDMS-01, packing and shipping of the insulators shall conform the following:

a. All parts shall be carefully packed for transport in such a manner that they are protected against mechanical damage and climatic conditions during transportation or storage.

b. Suppliers shall contact Materials Management Department for additional packing, handling and shipment instructions, as applicable.

c. Packing marking shall be as per clause 4.6.2

7.0 GUARANTEE

7.1 Supplier shall guarantee the spool, suspension, line post and stand off insulators against all defects arising out of faulty design, workmanship, or defective material for a period of two (2) years from date of delivery.

7.2 If no exceptions are taken to this specification and no list of deviation is submitted, it shall be deemed that in every respect the offered insulators conform to this specification. SEC interpretation of this specification shall be accepted.

8.0 SUBMITTALS

8.1 Submittals required with tender:

8.1.1 The vendor shall complete and return one copy of the attached technical data schedule with quotation.

8.1.2 Detailed dimensional drawing of insulators.

8.1.3 Type test certificates.

8.1.4 Catalogues.

8.2 Submittals required following award of contract are given below.

8.2.1 Manufacturing schedule, progress report and test schedule.

8.2.2 Test reports.

9. TECHNICAL DATA SCHEDULE

9.1 SPOOL INSULATOR

NO	DESCRIPTION	UNIT	SEC REQUIREMENTS	BIDDER DATA
1	TYPE OF INSULATOR		SPOOL	
2	NOMINAL VOLTAGE	V	127/231/400	
3	INSULATING MATERIAL		PORCELAIN	
4	COLOUR OF PORCELAIN		BROWN GLAZED	
5	MAXIMUM DIAMETER OF INSULATOR	mm	76	
6	NOMINAL TOTAL HEIGHT	mm	81	
7	GROOVE RADIUS	mm	11	
5	WET POWER FREQUENCY WITHSTAND (Min.)	kV	3	
6	DRY FLASHOVER VOLTAGE	kV	25	
7	WET FLASHOVER VOLTAGE	kV	12	
8	MECHANICAL STRENGTH	kN	17.8	
9	HOLE DIAMETER	mm	18	

9. TECHNICAL DATA SCHEDULE

9.2 LINE POST INSULATOR 13.8 kV WITH TOTAL CREEPAGE DISTANCE 552 mm

NO	DESCRIPTION	UNIT	SEC REQUIREMENTS	BIDDER DATA
1	NOMINAL SYSTEM VOLTAGE	kV	13.8	
2	INSULATING MATERIAL		PORCELAIN	
3	COLOUR OF PORCELAIN		BROWN GLAZED	
4	NUMBER OF SHEDS		BY VENDOR	
5	TIE TOP RADIUS SIDE TIE RADIUS NECK DIAMETER	mm mm mm	25 25 73	
6	TOTAL HEIGHT	mm	305	
7	SHED DIAMETER	mm	152	
8	MIN. CREEPAGE /KV	mm	40	
9	TOTAL CREEPAGE DISTANCE	mm	552	
10	DRY ARCING DISTANCE	mm	241	
11	CANTILEVER STRENGTH	KN	12.5	
12	FLASH OVER VOLTAGE POWER FREQUENCY (DRY) POWER FREQUENCY (WET) IMPULSE +VE IMPULSE -VE	kV	 110 85 180 205	
13	WITHSTAND VOLTAGE POWER FREQUENCY (DRY) POWER FREQUENCY (WET) IMPULSE +VE IMPULSE -VE	kV	 90 65 150 150	
14	MAX. R.I. VALUE AT TEST VOLTAGE OF 22 KV	µV	100	
15	STUD SIZE		M20	
16	COMPLETE WITH STUDS		SHORT STUD	
17	MASS OF INSULATOR	Kg	BY VENDOR	
18	MARKING		BY VENDOR	

9. TECHNICAL DATA SCHEDULE

9.3 LINE POST INSULATOR 33 kV WITH TOTAL CREEPAGE DISTANCE 1320 mm.

NO	DESCRIPTION	UNIT	SEC REQUIREMENTS	BIDDER DATA
1	NOMINAL SYSTEM VOLTAGE	kV	33	
2	INSULATING MATERIAL		PORCELAIN	
3	COLOUR OF PORCELAIN		BROWN GLAZED	
4	NUMBER OF SHEDS		BY VENDOR	
5	TIE TOP RADIUS SIDE TIE RADIUS NECK DIAMETER	mm mm mm	25 25 73	
6	TOTAL HEIGHT	mm	510	
7	SHED DIAMETER	mm	185 (Min)	
8	MIN. CREEPAGE /KV	mm	40	
9	TOTAL CREEPAGE DISTANCE	mm	1320	
10	DRY ARCING DISTANCE	mm	438	
11	CANTILEVER STRENGTH	KN	12.5	
12	FLASH OVER VOLTAGE POWER FREQUENCY (DRY) POWER FREQUENCY (WET) IMPULSE +VE IMPULSE -VE	kV	 175 150 290 380	
13	WITHSTAND VOLTAGE POWER FREQUENCY (DRY) POWER FREQUENCY (WET) IMPULSE +VE IMPULSE -VE	kV	 160 135 250 250	
14	MAX. R.I. VALUE AT TEST VOLTAGE OF 44 KV	μV	200	
15	STUD SIZE		M20	
16	COMPLETE WITH STUDS		SHORT STUD	
17	MASS OF INSULATOR	Kg	BY VENDOR	
18	MARKING		BY VENDOR	

9. TECHNICAL DATA SCHEDULE

9.4 LINE POST INSULATOR 33 kV WITH TOTAL CREEPAGE DISTANCE 825 mm.

NO	DESCRIPTION	UNIT	SEC REQUIREMENTS	BIDDER DATA
1	NOMINAL SYSTEM VOLTAGE	kV	33	
2	INSULATING MATERIAL		PORCELAIN	
3	COLOUR OF PORCELAIN		BROWN GLAZED	
4	NUMBER OF SHEDS		BY VENDOR	
5	TIE TOP RADIUS SIDE TIE RADIUS NECK DIAMETER	mm mm mm	25 25 73	
6	TOTAL HEIGHT	mm	368	
7	SHED DIAMETER	mm	178	
8	MIN. CREEPAGE /KV	mm	25	
9	TOTAL CREEPAGE DISTANCE	mm	825	
10	DRY ARCING DISTANCE	mm	311	
11	CANTILEVER STRENGTH	KN	12.5	
12	FLASH OVER VOLTAGE POWER FREQUENCY (DRY) POWER FREQUENCY (WET) IMPULSE +VE IMPULSE -VE	kV	 125 100 210 260	
13	WITHSTAND VOLTAGE POWER FREQUENCY (DRY) POWER FREQUENCY (WET) IMPULSE +VE IMPULSE -VE	kV	 100 80 170 170	
14	MAX. R.I. VALUE AT TEST VOLTAGE OF 30 KV	μV	200	
15	STUD SIZE		M20	
16	COMPLETE WITH STUDS		SHORT STUD	
17	MASS OF INSULATOR	Kg	BY VENDOR	
18	MARKING		BY VENDOR	

9. TECHNICAL DATA SCHEDULE

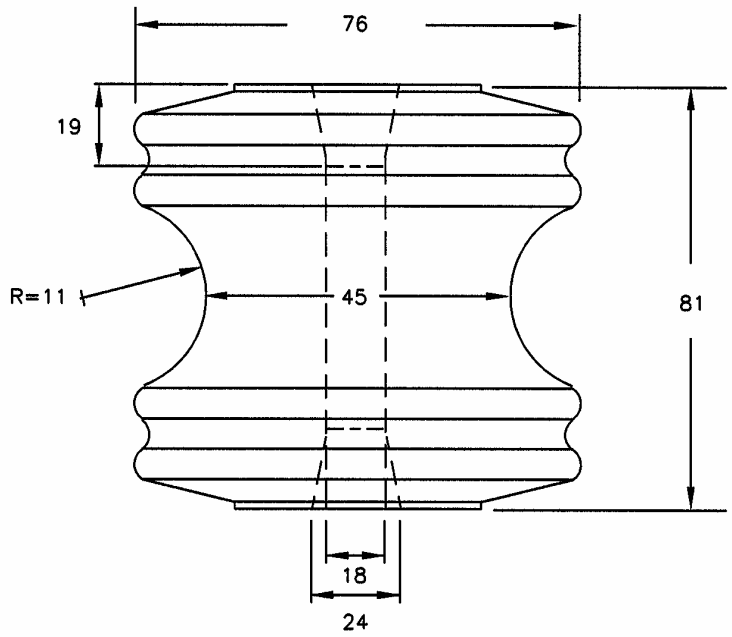
9.5 SUSPENSION INSULATOR FOR 13.8 and 33 kV SYSTEM

NO	DESCRIPTION	UNIT	SEC REQUIREMENTS	BIDDER DATA
1	TYPE OF SUSPENTION INSULATOR (DISC)		CLEVIS	
2	INSULATING MATERIAL		PORCELAIN	
3	COLOUR OF PORCELAIN		BROWN GLAZED	
4	MIN. CREEPAGE	mm	292	
5	DIAMETER	mm	254	
6	SPACING DISTANCE	mm	146	
7	MIN. IMPULSE WITHSTAND VOLTAGE	kV	110	
8	WET POWER FREQUENCY WITHSTAND VOLTAGE	kV	40	
9	DRY POWER FREQUENCY WITHSTAND VOLTAGE	kV	70	
10	PUNCTURE VOLTAGE	kV	110	
11	FLASHOVER VOLTAGE POWER FREQUENCY (Dry) POWER FREQUENCY (Wet) IMPULSE + ve IMPULSE - ve	kV	 80 50 125 130	
12	ELECTRO MECH. FAILING LOAD	kN	70	
13	R.I. VALUE at TEST VOLTAGE of 10 KV	μV	50	
14	NET WEIGHT	kg	BY VENDOR	
15	MARKING		REQUIRED	

9. TECHNICAL DATA SCHEDULE

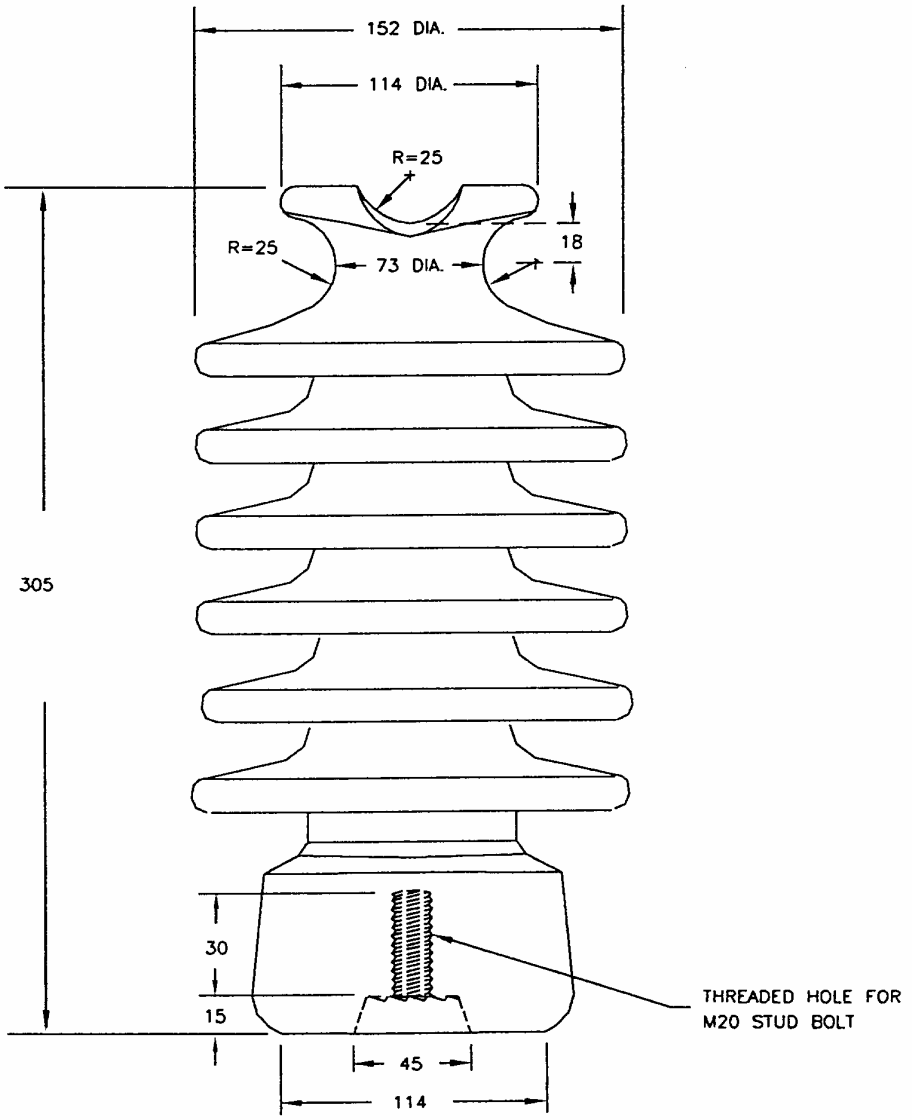
9.6 STAND OFF INSULATOR FOR 33KV SYSTEM

NO	DESCRIPTION	UNIT	SEC REQUIREMENTS	BIDDER DATA
1	NOMINAL SYSTEM VOLTAGE	kV	33	
2	INSULATING MATERIAL		PORCELAIN	
3	COLOUR OF PORCELAIN		BROWN GLAZED	
4	NUMBER OF SHEDS		BY VENDOR	
5	TOTAL HEIGHT	mm	355	
6	SHED DIAMETER	mm	195	
7	TOTAL CREEPAGE DISTANCE (minimum)	mm	660	
8	DRY ARCING DISTANCE	mm	254	
9	CANTILEVER STRENGTH	kN	4	
10	FLASH OVER VOLTAGE POWER FREQUENCY (DRY) POWER FREQUENCY (WET) IMPULSE +VE IMPULSE –VE	kV	 110 75 170 250	
11	WITHSTAND VOLTAGE POWER FREQUENCY (DRY) POWER FREQUENCY (WET) IMPULSE +VE IMPULSE –VE	kV	 70 60 150 150	
12	MAX. RIV. VALUE AT TEST VOLTAGE OF 22KV	µV	100	
13	STUD SIZE		M12	
14	NET WEIGHT	Kg	BY VENDOR	
15	MARKING		BY VENDOR	



SPOOL INSULATOR

TOLERANCES: AS PER ANSI
ALL DIMENSIONS ARE IN MILLIMETER

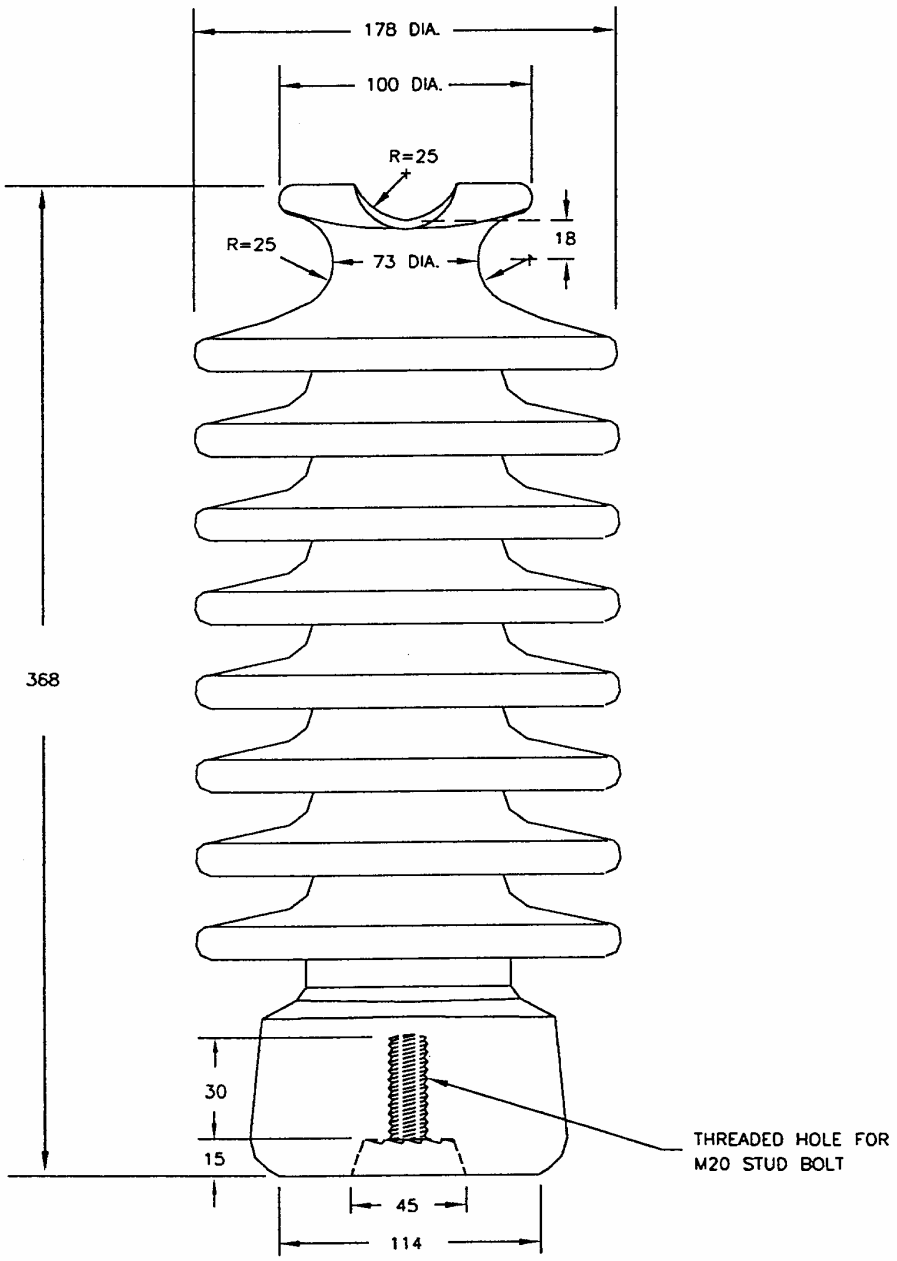


13.8KV LINE POST INSULATOR

WITH TOTAL CREEPAGE DISTANCE 552mm

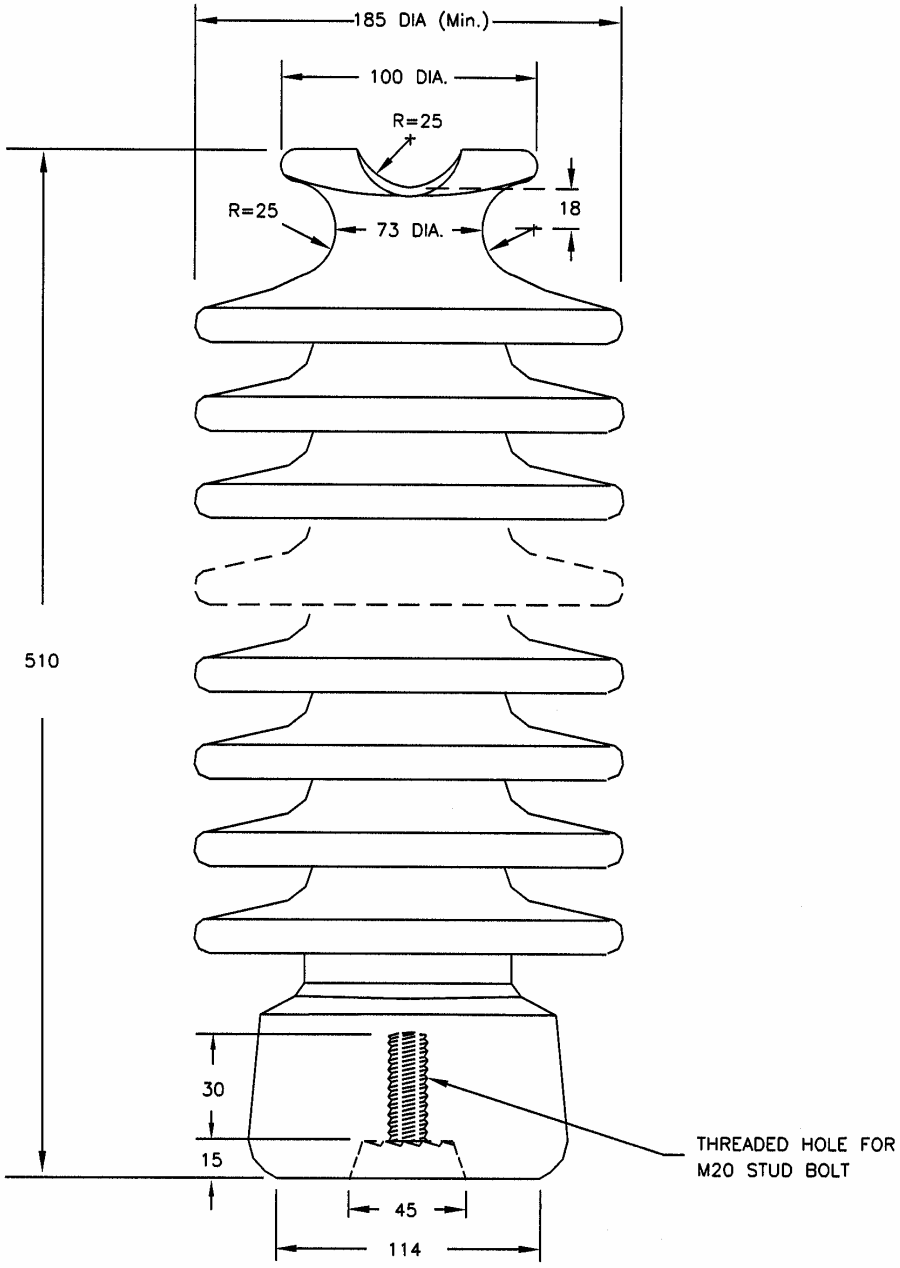
(40mm/KV)

TOLERANCES: AS PER IEC/ANSI
ALL DIMENSIONS ARE IN MILLIMETER



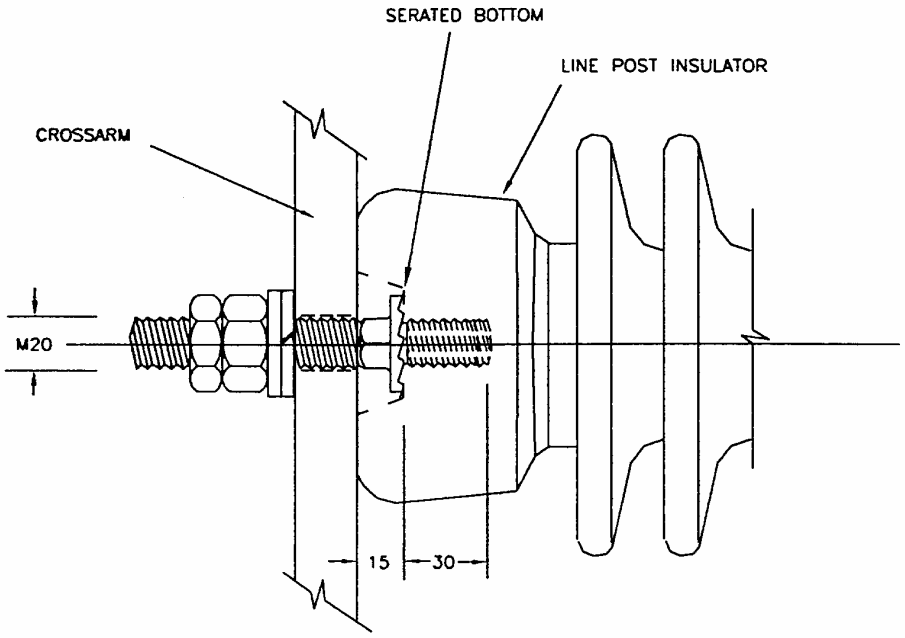
33KV LINE POST INSULATOR
WITH TOTAL CREEPAGE DISTANCE 825mm
(25mm/KV)

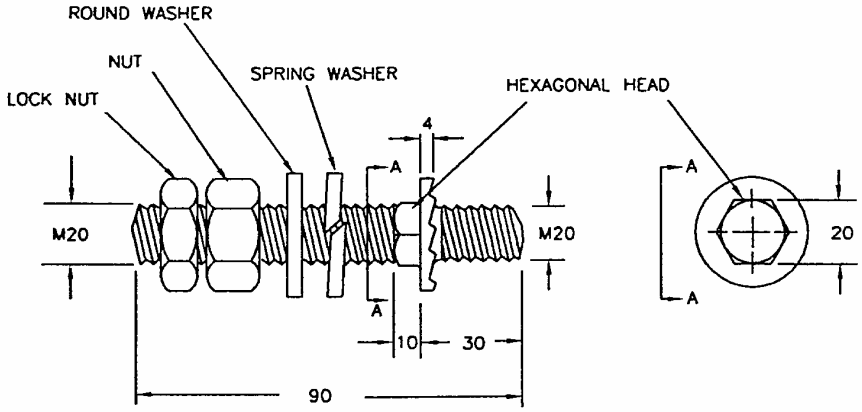
TOLERANCES: AS PER IEC/ANSI
ALL DIMENSIONS ARE IN MILLIMETER



33KV LINE POST INSULATOR
WITH TOTAL CREEPAGE DISTANCE 1320mm
(40mm/KV)

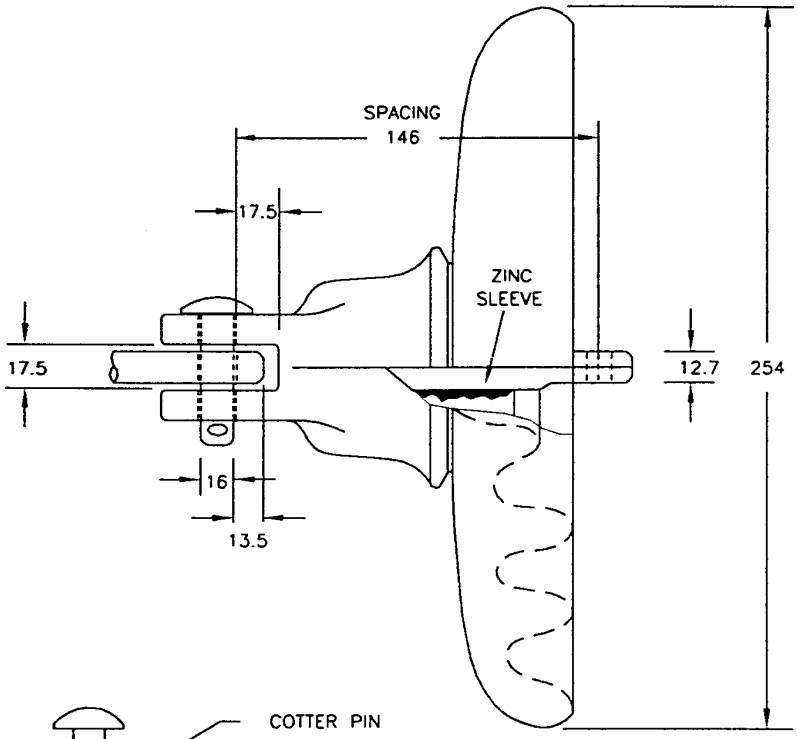
TOLERANCES: AS PER IEC/ANSI
ALL DIMENSIONS ARE IN MILLIMETER

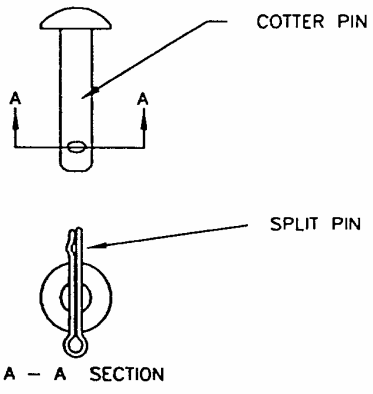




STEEL STUD

ALL DIMENSIONS ARE IN MILLIMETER

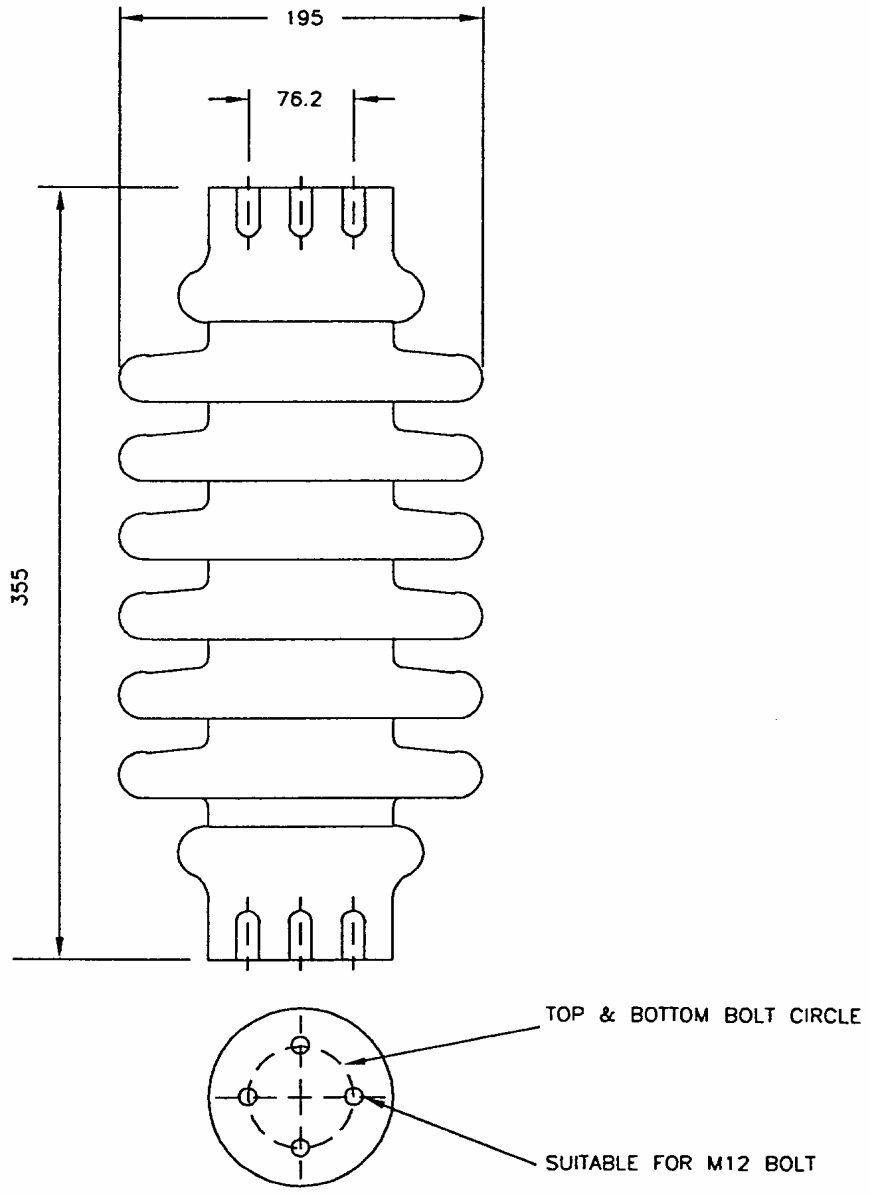




SELF LOCKING TYPE SPLIT PIN

SUSPENSION INSULATOR – CLEVIS TYPE

TOLERANCES: ACCORDING TO IEC/ANSI
ALL DIMENSIONS ARE IN MILLIMETER



STAND OFF INSULATOR

TOLERANCES: AS PER IEC/ANSI
ALL DIMENSIONS ARE IN MILLIMETER