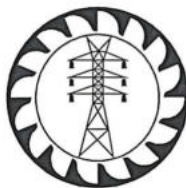


082:2019

CEB
SPECIFICATION

**MEDIUM VOLTAGE INSULATORS
AND HARDWARE ACCESSORIES**



**CEYLON ELECTRICITY BOARD
SRI LANKA**



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SPECIFICATION FOR MEDIUM VOLTAGE INSULATORS AND HARDWARE ACCESSORIES

1.0 SCOPE

This specification covers the general requirements of the design, manufacturing and testing of undermentioned Medium Voltage Hardware and Accessories.

Insulator Types:

Item Designation	Item Description
A	11kV / 33kV Pin Insulators (without pin).
B	11kV / 33kV Pin Post Porcelain Insulators.
C	11kV / 33kV Pin Post Composite Insulators.
D	11kV / 33kV Station Post Insulators.
E	Disc Insulator Unit (Normal Profile) 70kN/120kN.
F	Disc Insulator Unit (Aerodynamic Profile) 70kN/120kN.
G	33kV Composite Tension Insulators 70kN/120kN.

Insulator Hardware Fittings:

Item Designation	Item Description
H	Pins for 11kV / 33kV Pin Insulators.
I	Bolted Clamps (shackle gun) for Tension Insulator Sets for Raccoon Conductor.
J	Bolted Clamps (shackle gun) for Tension Insulator Sets for Lynx and Elm Conductor.
K	Crimped type clamps for Tension Insulator Sets for Lynx / Elm Conductor.
L	Crimped type clamps for Tension Insulator Sets for Raccoon Conductor.
M	Crimped type clamps for Tension Insulator Sets for Zebra Conductor.
N	Suspension Clamps for Raccoon conductors.
O	Suspension Clamps for Lynx and Elm conductors.
P	Suspension Clamps for Zebra conductors.
Q	70kN/120kN Anchor Shackle, Socket eye and Ball eye with accessories.

The procurement entity will prescribe items from the above categories with **relevant Voltage, Failing Load and Conductor Type** in price schedule as applicable.

2.0 SYSTEM PARAMETERS

(a)	Nominal voltage (U)	11 kV	33 kV
(b)	System highest voltage (U_m)	12 kV	36 kV
(c)	System frequency	50 Hz	50 Hz
(d)	Method of earthing	Effectively earthed	Non- Effectively earthed
(e)	System fault level / duration	12.5kA/1Second	16kA/1second



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
(e)	Operational altitude	From M.S.L. to 1900 m above M.S.L.
(f)	Isokeraunic (Thunder days) level	100 days

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 60383-1:1993	Insulators for overhead lines with a nominal voltage above 1000 V - Part 1: Ceramic or glass insulator units for a.c. systems - Definitions, test methods and acceptance criteria
(b)	IEC 60383-2:1993	Insulators for overhead lines with a nominal voltage above 1000 V - Part 2: Insulator strings and insulator sets for a.c. systems - Definitions, test methods and acceptance criteria
(c)	IEC 61109:2008	Insulators for overhead lines - Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V - Definitions, test methods and acceptance criteria.
(d)	IEC 61466-1:2016	Composite string insulator units for overhead lines with a nominal voltage greater than 1 000 V - Part 1: Standard strength and end fittings.
(e)	IEC 60120:1984	Dimensions of ball and socket couplings of string insulator units.
(f)	IEC 60305:1995	Insulators for overhead lines with a nominal voltage above 1000 V - Ceramic or glass insulator units for a.c. systems - Characteristics of insulator units of the cap and pin type.
(g)	IEC 60372:1984	Locking devices for ball and socket couplings of string insulator units - Dimensions and tests.
(h)	IEC 60720:1981	Characteristics of line post insulators.
(i)	IEC 60273:1990	Characteristic of indoor and outdoor post insulators for systems with nominal voltages greater than 1000 V.
(j)	IEC 60437:1997	Radio interference test on high-voltage insulators.
(k)	IEC 61952:2008	Insulators for overhead lines - Composite line post insulators for A.C. systems with a nominal voltage greater than 1 000 V - Definitions, test methods and acceptance criteria.
(l)	IEC TS 60815-2:2008	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 2: Ceramic and glass insulators for a.c. systems
(m)	IEC TS 60815-3:2008	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 3: Polymer insulators for a.c. systems
(n)	IEC 62217 - 2012	Polymeric HV insulators for indoor and outdoor use - General definitions, test methods and acceptance criteria
(o)	BS EN ISO 1461: 2009	Hot dip galvanized coatings on fabricated iron and steel

		articles. Specifications and test methods.
(p)	BS 3288-1:2014	Insulator and conductor fittings for overhead power lines. Performance and general requirements.
(q)	BS 3288-2:2009	Insulator and conductor fittings for overhead power lines. Specification for a range of insulator fittings.

Material conforming to other International Standards which are equal to or higher but not less stringent than the Standards stipulated above may be offered. When such alternative Standards are used, reference to such Standards shall be quoted and English language copies of such Standards shall be provided with the offer.

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

5.0 BASIC FEATURES

5.1. General Design

The insulators will be in service in a damp tropical climate where intense lightning storms at certain periods of the year are expected. The design shall take this into account as well as to minimize the effect of local corona formation and discharge likely to cause radio interference. Insulators shall withstand dry impulse withstand voltage (1.2/50 μ s) of 75kV in case of 11kV and 170kV in case of 33kV insulators. Further it shall also withstand Wet Power Frequency (1 min.) voltage of 28kV in case of 11kV and 70kV in case of 33kV insulators.

Porcelain insulators shall be made of good commercial grade wet-process Porcelain (brown glazed). The surface shall be smooth, uniform, and the glazed area shall be free surface irregularities such as sharp edges, cavities, dents and unglazed spots etc.

The design of all insulators shall be such as to facilitate inspections, cleaning, repairs, and hot line maintenance. All corresponding parts to be made to gauge and be interchangeable.

All iron and steel parts shall be galvanized after subjecting to the processes such as sawing, shearing, drilling, punching, filing, bending and machining. Galvanizing shall be applied by hot dip process to comply with the BSEN ISO 1461 (2009) specified. The galvanized hardware fittings shall have a smooth and uniform thickness of zinc coating without any sharp edges.

The thickness of zinc coating shall not be less than 85 μ m in plain surface. All hardware items shall be treated with sodium dichromate after galvanizing and stored under well ventilated conditions to prevent the formation of white rust.

5.2. Pin Insulators (Item A)

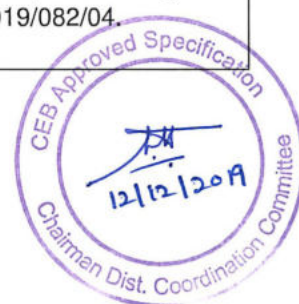
1.	Technical Requirements		
1.1	Rated Voltage (Max. Voltage)	11kV (12kV)	33kV (36kV)
1.2	Material	Porcelain	
1.3	Insulator Class	Class B as per IEC 60383-1	
1.4	Radio Interference	Semi-conducting layer to reduce radio frequency interference. As per IEC - 60437 - 1997 (30dB).	



1.5	Applicable Conductor Size (mm), max.	28.7	
1.6	Size of channel iron cross arm for fixing insulators (mm)	100x50 x 6	
1.7	Minimum Failing Load (kN)	10	
1.8	Minimum Creepage Distance (mm)	275	825
1.9	Creepage Factor	<4 (For both Overall and Local)	
2.	Manufacture		
2.1	Insulators	The design parameters of the Insulators shall be in accordance with the Drawing No. CEB/DS&S/2019/082/01. The porcelain shall not engage directly with the hard metal and the pin insulator shall be provided with the thimble of Lead/Zinc material to accommodate the steel pin.	
2.2	Insulator head	Shall be as indicated as in the Drawing No. CEB/DS&S/2019/082/02.	
2.3	Threaded thimbles	Threaded thimbles shall be cemented to the insulators to receive the insulator pins with large steel heads and the internal thread of thimble shall comply with the dimensions of the large steel pin insulator head (reference no 16 of BS 3288-2). The upper part above thimble should have a cushioning material.	

5.3. Pin Post Insulators (Item B & C)

1.	Technical Requirements				
1.1	Material	Porcelain – Item B		Silicon Rubber – Item C	
1.2	Rated Voltage (Max. Voltage)	11kV(12kV)	33kV(36kV)	11kV(12kV)	33kV(36kV)
1.3	Insulator Class	Class A as per IEC 60383-1			
1.4	Radio Interference	Semi-conducting layer to reduce radio frequency interference. As per IEC - 60437 - 1997 (30dB).			
1.5	Applicable Conductor Size (mm), max.	28.7			
1.6	Size of channel iron cross arm for fixing insulators (mm)	100x50 x 6			
1.7	Minimum Failing Load (kN)	10			
1.8	Minimum Creepage Distance (mm)	310	950	340	1000
1.9	Creepage Factor	<4 (For both Overall and Local)			
2.	Manufacture				
2.1	Insulators	The top/side shall have a groove with a minimum radius of 16mm to attach AAC, AAAC and ACSR conductors. The flange cover shall be made of UV resistant, flame-retardant and anti-tracking type semi conductive polymer/rubber material as per drawing no.		Manufacture shall be in accordance with clause 5.6 (2). The top/side shall have a groove with a minimum radius of 16mm to attach AAC, AAAC and ACSR conductors as per drawing no. CEB/DS&S/2019/082/04.	



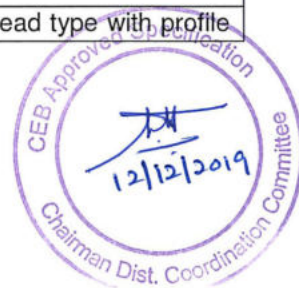
		CEB/DS&S/2019/082/03.	
2.2	Insulator Steel Pin	The medium voltage pin post insulator shall be supplied complete with necessary hardware such as steel pin, nuts, spring washers and two numbers of flat washers of suitable size for attachment to the channel iron cross-arms as specified above. The shank length of the pin shall be not less than 140mm and not more than 185mm. Diameter of the pin shall be between 20mm – 22mm.	

5.4. Station Post Insulators (Item D)

1.	Technical Requirements		
1.1	Rated Voltage (Max. Voltage)	11kV(12kV)	33kV(36kV)
1.2	Material	Porcelain	
1.3	Insulator Class	Class A as per IEC 60383-1	
1.4	Size of channel iron for fixing insulators (mm)	100x50 x 6	
1.5	Minimum Failing Load (kN)	10	
1.6	Total Creepage Distance (mm)	300	900
1.7	Creepage Factor	<4 (For both Overall and Local)	
2.	Manufacture		
2.1	Insulators	The Solid Core, Post Insulators as per IEC 60383, shall be made of brown glazed porcelain suitable for the assemblies of MV equipment and bus bars.	
2.2	Steel Hardware	The Insulators and fittings shall be in accordance with the Drawing No. CEB/DS&S/2019/082/05. Both ends of the Insulator shall be fitted with malleable cast Iron Caps with 4 Tapped Holes, one end to receive the MV equipment or bus bar and the other end for fixing on Base Frame. The Insulators supplied shall be complete with 4 bolts to fix the fixtures to the Insulator Top Cap and 4 Bolts and 4 Spring Washers to fix the Post Insulator to the Base Frame.	

5.5. Disc Insulator Units (Item E & F)

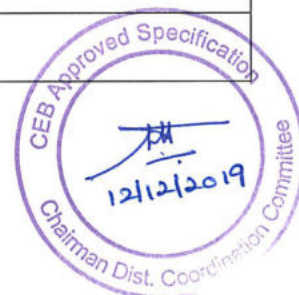
	Profile Type	Normal Profile		Aerodynamic Profile	
1.	Technical Requirements				
1.1	Rated Voltage (Max. Voltage)	11kV(12kV)			
1.2	Material	Porcelain/ Toughened Glass			
1.3	Insulator Class	Class B as per IEC 60383-1			
1.4	Porcelain Diameter (mm)	255		280 (minimum)	
1.5	Insulator Spacing (mm)	146		146	
1.6	Standard Coupling	16	20	16	20
1.7	Type/Designation as per IEC 60305.	U70BL	U120B	U70BLP	U120BP
1.8	Minimum Failing Load of a disc (kN)	70	120	70	120
1.9	Total Creepage Distance per disc (mm)	295		350	
1.10	Creepage Factor	<4 (For both Overall and Local)			
2.	Manufacture				
2.1	Insulators	The insulator shall be of the cylindrical head type with profile			



		type indicated above and the entire surface of the insulator that will expose after (hardware) assembly shall be a smooth uniform glazed surface without any form of depression /defects. The insulators shall have the correct shed formation to satisfy the specified flash-over characteristics stipulated in the relevant standards. The drawing reference nos. CEB/ CEB/DS&S/2019/082/06 and CEB/ CEB/DS&S/2019/082/07 indicate the general outlook of the Normal Profile and Aerodynamic Profile disc insulators respectively.
2.2	Hardware	The hardware of the disc insulators shall be of the Cap and Pin Type with '16B' Ball and Socket Couplings for 70kN failing load discs and '20' Ball and Socket Couplings for 120kN failing load discs as per IEC 60120.
2.3	Caps	Shall be made of malleable cast iron. To withstand the damp tropical saliferous climate having higher salinity level, the cap shall be hot dip galvanized and the thickness of galvanizing coating shall not be less than 100 microns.
2.4	Pins	Shall be made of steel.
2.5	Zinc sleeve	The steel pin shall be provided with a Zinc (sacrificial) anti-corrosion sleeve at the interface between pin and internal cement, The thickness of the zinc sleeve shall not be less than 5mm and it shall protrude not less than 10mm from the lower surface of the cement. The purity of the zinc sleeve shall not be less than 99.7%. The zinc sleeve shall have sufficient adhesion in area on the pin so that fused area shall be more than 80% of the total area of the interface between zinc sleeve and the steel pin.
2.6	Locking Device (Should be provided with insulator disc)	The locking devices for the insulator units shall be made of Stainless Steel / Phosphor Bronze W- Clip and shall comply with IEC 60372 for the standard coupling of 16B or 20 as applicable. Thickness of the clip shall be in accordance with IEC 60372/IEC 60305 standards for the respective couplings. The locking device in its locking position shall prevent removal of insulators. The design shall be such as to allow (hot line maintenance) easy removal for replacing of insulator units or fittings without the necessity to remove the insulator string from the cross arms.

5.6. Composite Tension Insulator (Item G)

1.	Technical Requirements	
1.1	Rated Voltage (Max. Voltage)	33kV(36kV)
1.2	Material	Silicon Rubber
1.3	Insulator Class	Class A as per IEC 60383-1
1.4	Minimum Failing Load (kN)	70/120 as applicable (IEC 60466-1)
1.5	Total Creepage Distance (mm) , minimum	1000



2.	Manufacture	
2.1	Core	The insulator core shall be made of brittle fracture-resistant electrical grade epoxy / vinyl ester / Iso-polyester based fiberglass rod to achieve maximum failing load. The core shall be mechanically and electrically sound, free from voids, foreign substances and manufacturing flaws. Also the design shall be such as to ensure that the core is totally encapsulated and fully sealed, from the live to the earthed ends, by the insulating material from the environment, in order to avoid ingress of moisture. If any tacky substances are used as sealers, they shall not be exposed to environmental influence.
2.2	Housing & Weather-sheds	The housing and Weather-sheds shall be made of silicone rubber material in order to maintain their hydrophobicity during long term service in critical environments. A minimum thick sheath of 3.0 mm of Silicone Rubber shall be extruded or injection moulded on the reinforced fiberglass rod. The polymer sleeve and weather-shed insulating material shall have a chemical structure of 100 percent silicone rubber before fillers are added. The silicone rubber shall be firmly bonded to the rod, be seamless, smooth and free from imperfections. The strength of the silicone rubber to rod interface shall be greater than the tearing strength of the silicone rubber. The weather-sheds shall be firmly bonded to the sheath, vulcanized to the sheath or molded as part of the sheath and be seamless smooth and free from imperfections. The strength of the silicone rubber weather-shed to sheath interface shall be greater than the tearing strength of the silicone rubber. Weather-sheds shall be at intervals to provide optimum electrical performance and the weather-shed designs should provide a protected bottom surface that tends to keep dry in wet conditions.
2.3	Hardware base and housing	The gap between hardware base and housing shall be sealed by an elastomer with permanent elasticity. The sealing shall stick permanently to the surface of the material as well as to the housing. The base should be attached to insure a uniform distribution of the mechanical load to the rod. The schematic of the composite insulator is indicated in drawing no. CEB/DS&S/2019/082/08. Required number of cotter pins and split pins shall be provided as per the given drawing.
2.4	Washing	The insulator shall be capable of withstanding high-pressure power washing.



5.7. Pins for 11kV / 33kV Pin Insulators (Item H)

Insulator Pins shall be supplied complete with hot dip galvanized steel pin, nut, spring washer and two numbers of circular flat washers of suitable size in accordance with Drawing No. CEB/DS&S/2019/082/09 and as per BS 3288-2 standard.

The Insulator Pins shall be suitable for fixing the insulators on 100x50x6mm Channel Iron Cross-arms. The shank length of the Pin shall be between 140mm – 185mm. The screwed length shall be 5 mm less than the shank length of the pin with isometric coarse thread.

5.8. Bolted Clamps (shackle gun) for Tension Insulator Sets for Racoon/Elm/Lynx Conductor (Item I, J)

The bolted type conductor tension clamp (Dead End Clamp) shall be made of aluminium alloy with minimum three U bolts as stipulated in drawing no. CEB/DS&S/2019/082/10 and it shall be suitable to be used with the conductor as stipulated in the **schedule of prices**.

5.9. Crimped type clamps for Tension Insulator Sets for Racoon/Elm/Lynx/Zebra Conductor (Item K, L and M)

The compression type conductor tension clamp (Dead End Clamp) with jumper terminal shall be made of aluminium alloy/steel and the jumper lug made of aluminium alloy shall be fixed to the jumper terminal with two bolts.

The compression type tension clamp for Elm conductor shall be of single part fitting made of aluminium alloy and for Lynx/Raccoon conductor it shall be of two-part fitting made of steel and aluminium alloy with jumper socket as shown in the drawing no. CEB/DS&S/2019/082/11 and as requested in the **Schedule of Prices**.

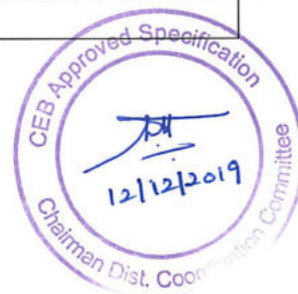
5.10. Suspension Clamps for Racoon/Elm/Lynx/Zebra conductor (Item N,O and P)

Conductor Suspension Clamp shall be made of aluminium alloy with 2 U bolts as per drawing no. CEB/DS&S/2019/082/12. for attaching conductors as stipulated in the **Schedule of Prices**.

5.11. 70kN/120kN Anchor Shackle, Socket eye and Ball eye with accessories (Item Q)

This shall be complete with accessories in accordance with BS 3288-2 mentioned below. The required failing load shall be indicated in the **Schedule of Prices**.

	Item	Reference No as per BS 3288-2 for minimum failing load 70kN	Reference No as per BS 3288-2 for minimum failing load 120kN	Drawing Nos.
a.	Anchor Shackle with cotter pin and split pin	15/29 A or 15/33 A	28/29 A	CEB/DS&S/2019/082/13
c.	Ball Eye with accessories	15/30	28/30	CEB/DS&S/2019/082/14
b.	Socket Eye (W-Clip inserted) with cotter pin and split pin	15/35	28/36A	CEB/DS&S/2019/082/15



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 Insulator/Hardware Category where manufacturing is intended. 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 ten (10) years experience in manufacturing Insulators and/or hardware fittings as applicable. Out of this period offered item should have been supplied successfully outside the country of the manufacturer for minimum of five (5) years for usage in utilities. The product offered has to be in same voltage range of offered item and shall have been used in service utilities over past 5 years.

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

6.3. Type Tests

The following Type Test Certificates conforming to above referred standards in Clause 4.0 or any other international standard which is not less stringent, issued by:

Either

- (a) an accredited independent testing laboratory acceptable to the CEB or
- (b) an accredited or independent testing laboratory acceptable to the CEB where the type tests have been witnessed by CEB or a reputed independent body acceptable to 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 and accredited scope 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.



Type Tests for Insulators in accordance with IEC 60383-1, IEC 60383-2, IEC 61109 and IEC 61952 as applicable:

Test Description	Item Designation						
	A	B	C	D	E*	F*	G
Verification of the dimensions	√	√	√	√	√	√	√
Dry lightning impulse withstand voltage test	√	√	√	√	√	√	√
Wet- power frequency withstand voltage test	√	√	√	√	√	√	√
Mechanical failing load test	√	√	√	√	√	√	√
Electro-mechanical failing load test	-	-	-	-	√	√	-
Thermal mechanical performance test as per IEC60575	-	-	-	-	√	√	-
Artificial pollution tests as per IEC60507	-	-	-	-	-	√	-
Residual strength test as per IEC 60797	-	-	-	-	-	√	-
Cement Auto Clave Expansion test as per ANSI C29-2:1992 & ASTM C151.84	-	-	-	-	-	√	-
Power arc test as per IEC 61467	-	-	-	-	-	√	-
Qualification tests for W-Clips as per IEC 60372 (Hardness Test and Corrosion Resistance Test)	-	-	-	-	√	√	-

*The Test Certificates shall be given for string insulator unit (disc) as well as for complete Suspension and Tension Insulator sets as applicable.

Type Tests for Insulator fittings in accordance with BS 3288-1 as applicable:

Test Description	Item Designation				
	H	I & J	K,L & M	N,O & P	Q
Mechanical tests	√	√	√	√	√
Resistance tests	-	√	√	-	-
Electrical heating cycle test	-	√	√	-	-
Qualification tests for W-Clips as per IEC 60372 (Hardness Test and Corrosion Resistance Test)	-	-	-	-	√

6.4. Design Tests

Following design tests as per the relevant standards prescribed in clause 4.0 shall be furnished with the offer in case of composite insulators (for item C and G) as applicable:

- **Tests on interfaces and connections of end fittings**
 - (a) Pre-stressing – Sudden load release pre-stressing
 - (b) Thermal-mechanical pre-stressing
 - (c) Water immersion pre-stressing
 - (d) Verification tests
 - (e) Visual examination
 - (f) Steep-front impulse voltage test
 - (g) Dry power-frequency voltage test
- **Tests on shed and housing material**
 - (a) Hardness test



- (b) Accelerated weathering test
- (c) Tracking and erosion test
- (d) Flammability test

- **Tests on the core material**

- (a) Dye penetration test
- (b) Water diffusion test

- **Assembled core load-time test**

- (a) Determination of the average failing load of the core of the assembled insulator
- (b) Control of the slope of the strength-time curve of the insulator

7.0 INFORMATION TO BE FURNISHED WITH THE OFFER

The following shall be furnished with the offer.

(a) Following technical details in English clearly identifying the offered items, but not limited to:

- (i) Comprehensive catalogues.
- (ii) Dimensional drawings.
- (iii) Schematic diagrams.
- (iv) Calculations, graphs and tables.
- (v) Operational literature.

(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 and Design Test Certificates in accordance with the clause 6.3 and 6.4.

(e) Duly filled and signed 'Annex - B: Schedule of Technical Requirements and Guaranteed Technical Particulars'.

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

8.0 PERFORMANCE GUARANTEES AND WARRANTY

Manufacturer should provide CEB a warranty ensuring that items supplied meet the specification and any defected items shall be replaced without extra cost during the first year after the final delivery to CEB stores.

9.0 SAMPLES

One sample of the make and model of the item quoted shall be supplied with the offer by the Bidder to facilitate analysis and evaluation of tender.

10.0 SPARES

Not Applicable.



11.0 PACKING AND LABELING/MARKING

11.1. Packing

Insulators and Hardware Fittings shall be packed in non-returnable palletized boxes suitable for overseas shipment to a tropical country.

In packing cases where timber is used for reinforcement, the thickness of such timber parts shall not be less than 25mm and the packing shall also be suitable to withstand rough handling without sustaining damages.

The following details shall be marked clearly on the outside of all packages:-

- a) Name of Item and Voltage rating
- b) Quantity
- c) Weight

11.2. Identification and Labeling/Marking

The Identification details shall be permanently marked as below on the insulators and hardware fittings and they shall be weatherproof.

In case of Insulators:

- a) Manufacturer's Identification
- b) Minimum failing load in kN.
- c) Year of manufacture.
- d) Coupling type designation if applicable.

In case of Hardware fittings:

- a) Manufacturer's Identification
- b) Minimum failing load in kN and coupling type designation if applicable.

12.0 INSPECTION AND TESTING

12.1. Routine Tests

Depending on the choice of the applicable standards, the following relevant Routine Test Certificates conforming to, but not limited to, the IEC 60383/ IEC 61109/BS 3288 standards shall be furnished for the observation of the Engineer appointed by the purchaser at the time of inspection. In addition, the routine test certificates shall be sent with the shipment of the items.

- (a) Mechanical routine tests
- (b) Electrical routine tests
- (c) Visual examinations

12.2. 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.



12.3. Acceptance Tests

Depending on the choice of the applicable standards, the following Sample/Acceptance Tests conforming below mentioned standards shall be witnessed by the Engineer appointed by CEB.

Acceptance Tests for Insulators in accordance with IEC 60383-1, IEC 60383-2, IEC 61109, IEC 61952 and IEC 60372 as applicable:

Test Description	Item Designation						
	A	B	C	D	E	F	G
Verification of dimensions	√	√	√	√	√	√	√
Temperature cycle test	√	√	-	√	√	√	-
Mechanical failing load test	√	√	-	√	√	√	-
Puncture withstand test	√	-	-	-	√	√	-
Porosity Test	√	√	-	√	√	√	-
Galvanizing test	√	√	√	√	√	√	√
Verification of the locking system	-	-	-	-	√	√	√
Verification of the tightness of the interface between end fittings and insulator housing	-	-	-	-	-	-	√
Verification of the specified mechanical load/cantilever load	-	-	√	-	-	-	√
Verification of displacement	-	-	-	-	√	√	-
Electro-mechanical failing load test	-	-	-	-	√	√	-
Sample tests for W-Clips as per IEC 60372	-	-	-	-	√	√	-

Acceptance Tests for Insulator fittings in accordance with BS 3288-1, IEC 60372 as applicable:

Test Description	Item Designation				
	H	I & J	K, L & M	N, O & P	Q
Verification of the dimensions	√	√	√	√	√
Mechanical Tests/Electrical Tests	√	√	√	√	√
Galvanizing Tests	√	√	√	√	√
Clamp Bolt Tightening Tests	-	√	-	-	-
Sample tests for W-Clips as per IEC 60372	-	-	-	-	√

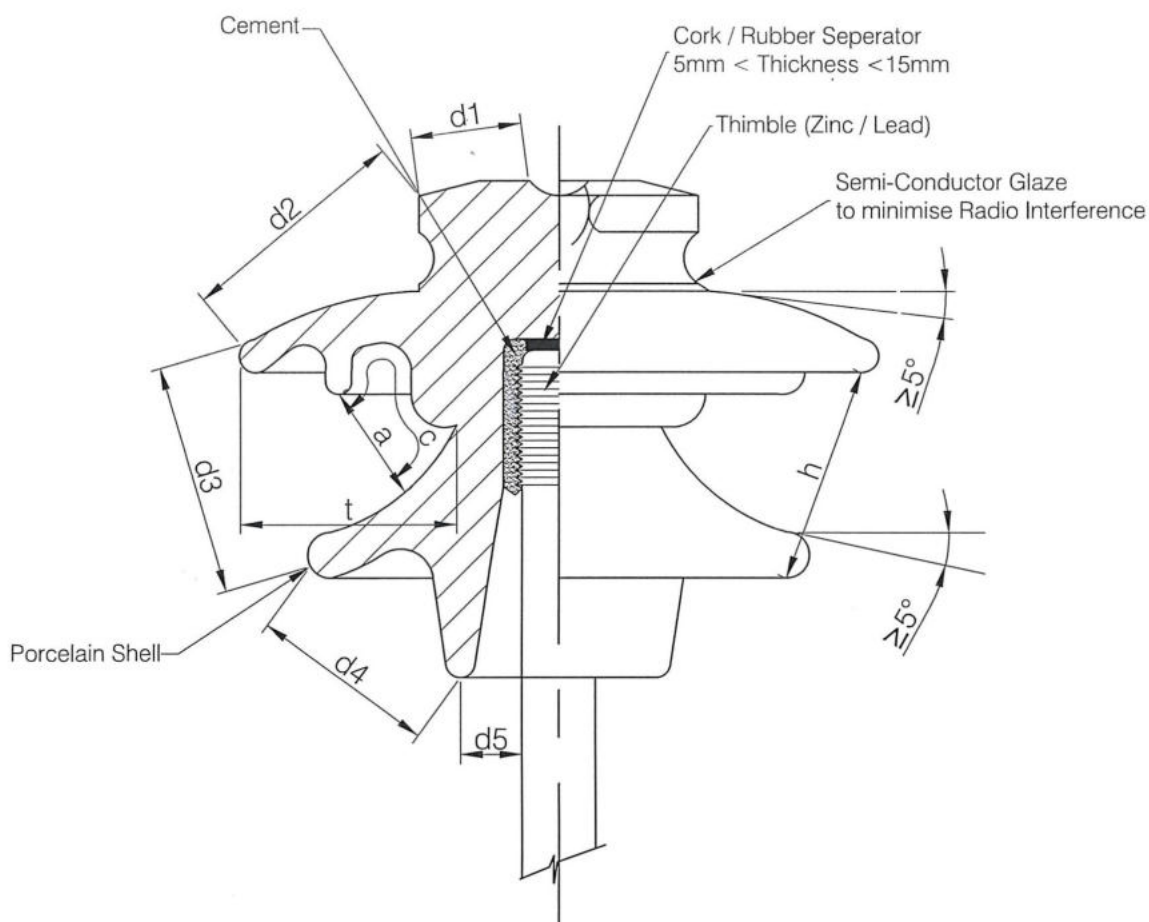
13.0 ANNEXES

- A1** :Design Parameters for Porcelain Pin Type Insulator for MV Lines
- A2** :Head of MV Porcelain Insulators
- A3** :Porcelain Pin Post Insulator 11 kV / 33 kV
- A4** :Composite Pin Post Insulator 11kV / 33 kV
- A5** :Station Type Porcelain Post Insulator 11 kV & 33 kV Reference IEC Publication: 60273
- A6** :Porcelain Disc Insulators Normal Profile
- A7** :Porcelain Disc Insulators Aerodynamic Type
- A8** :Schematic Diagram of Silicon Rubber Composite Insulator



- A9** :11 kV & 33 kV Insulator Pin
- A10** :Schematic Diagram of Bolted Tension Clamps (70kN)
- A11** :Schematic Diagram of Compression Clamp (120kN)
- A12** :Schematic Diagram of Suspension Clamp (70 kN)
- A13** :Schematic Diagram of Anchor Shackle For Composite and Porcelain Type Insulators
(Reference Standard. BS 3288-2)
- A14** :Schematic Diagram of Ball Eye (Reference Standard: BS 3288-2)
- A15** :Schematic Diagram of Socket Eye (Reference Standard BS 3288-2)
- B1** :Schedule of Technical Requirements and Guaranteed Technical Particulars - Properties of
Material used for Insulators
- B2** :Schedule of Technical Requirements and Guaranteed Technical Particulars - For Pin, Pin Post
and Station Post Insulators
- B3** :Schedule of Technical Requirements and Guaranteed Technical Particulars - For Disc
Insulators
- B4** :Schedule of Technical Requirements and Guaranteed Technical Particulars - For Composite
Tension Insulators
- B5** :Schedule of Technical Requirements and Guaranteed Technical Particulars - For Insulator
Hardware Fittings
- C** :Non – Compliance Schedule





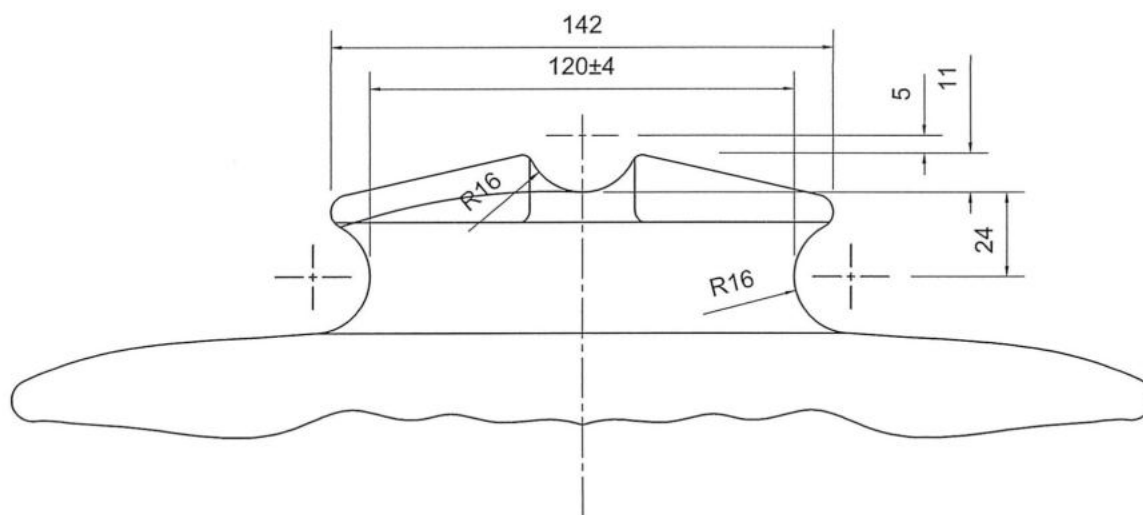
$$\text{Overall Creepage Factor} = \frac{\text{Creepage}}{(d1 + d2 + d3 + d4 + d5)} < 4$$

$$\text{Local Creepage Factor} = \frac{c}{a} < 4$$

$$\frac{\text{Shed spacing}}{\text{Shed overhang}} = \frac{h}{t} > 0.8$$



 CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	DESIGN PARAMETERS FOR PORCELAIN PIN TYPE INSULATOR FOR MV LINES		DRAWN : LALANI	EDITED : HARSHA
	DESIGNED BY	APPROVED BY	DATE : NOV - 2019	
			DRG. NO : DS&S/2019/082/01	
			CAD NO :	

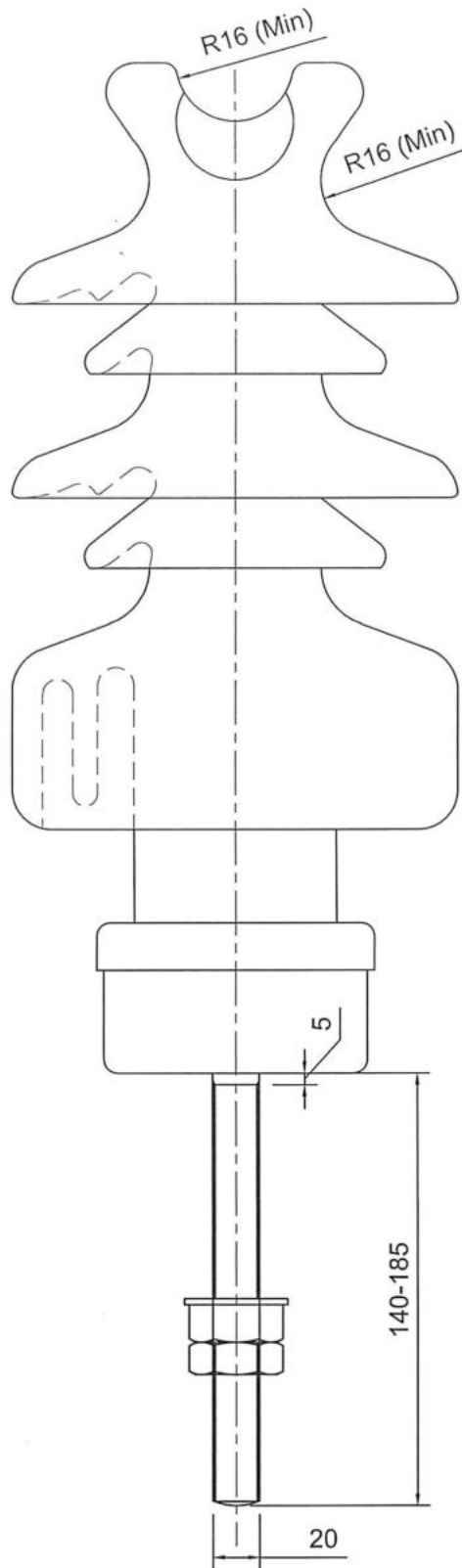


NOTE :

Tolerances shall be $[0.04d + 1.5]$ mm, where 'd' is the dimensions shown in the drawing.

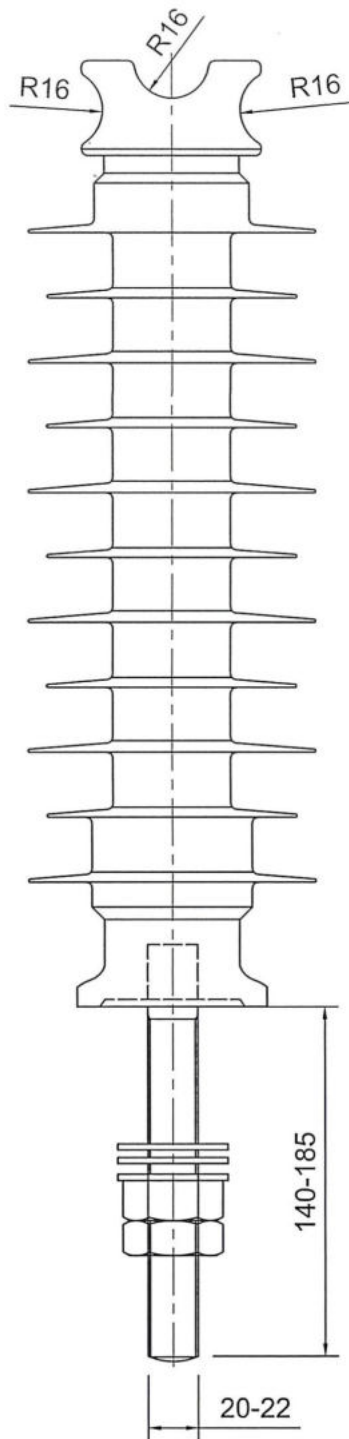
ALL DIMENSIONS ARE IN MILLIMETRES.

 CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	HEAD OF MV PORCELAIN INSULATORS		DRAWN : LALANI	EDITED : HARSHA
	DESIGNED BY	APPROVED BY	DATE : NOV - 2019	
			DRG. NO : DS&S/2019/082/02	
			CAD NO :	
	EE (DC)	CHAIRMAN, SPECIFICATION COMMITTEE		



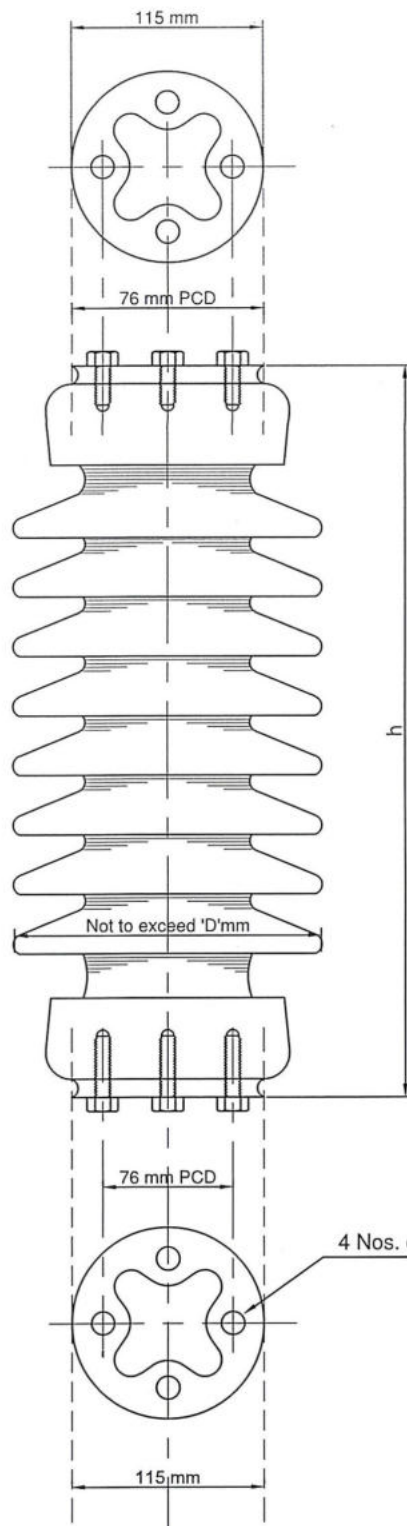
ALL DIMMENSIONS ARE IN MILLIMETERS

 CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	PORCELAIN PIN POST INSULATOR		DRAWN : LALANI	EDITED : HARSHA
	11 kV / 33 kV		DATE : NOV - 2019	
	DESIGNED BY	APPROVED BY	DRG. NO : DS&S/2019/082/03	
	EE (DC)	CHAIRMAN, SPECIFICATION COMMITTEE	CAD NO :	



ALL DIMMENSIONS ARE IN MILLIMETERS

 CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	COMPOSITE PIN POST INSULATOR		DRAWN : LALANI	EDITED : HARSHA
	11kV / 33kV		DATE : NOV - 2019	
	DESIGNED BY	APPROVED BY	DRG. NO : DS&S/2019/082/04	
			CAD NO :	
DISTRIBUTION COORDINATION BRANCH	EE (DC)	CHAIRMAN, SPECIFICATION COMMITTEE		



RATED VOLTAGE (Max)	IEC-60273 IDENTIFICATION	(D) mm	(h) mm
11kV (12kV)	C10-75	190	215±1
33kV (36kV)	C10-170	245	445±1

CREEPAGE DISTANCE CLASS 2

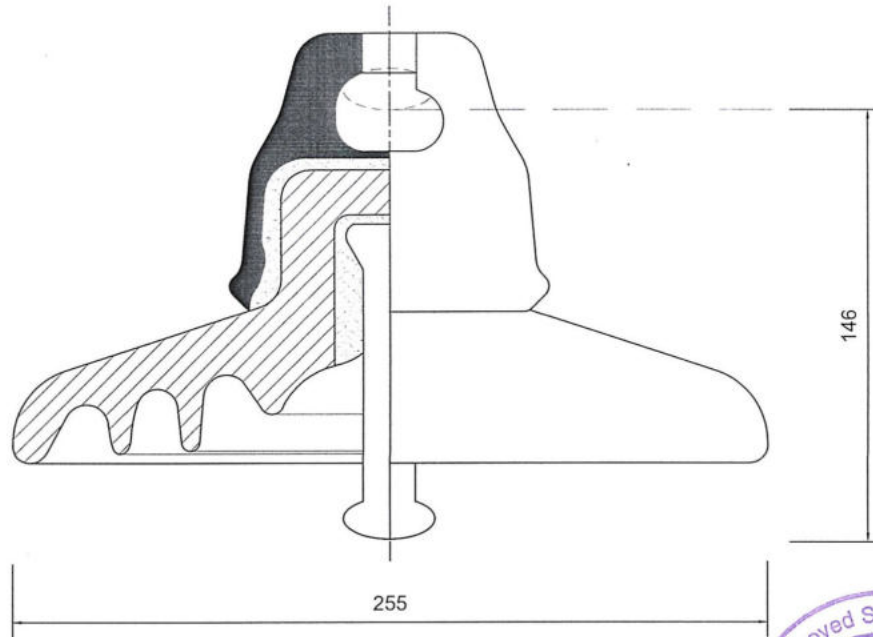
1. Total Creepage distance not less than 25mm/kV of normal voltage.
2. Protected Creepage distance not less than 35% of the above.

4 Nos. of Holes tapped M12 on 76 PCD

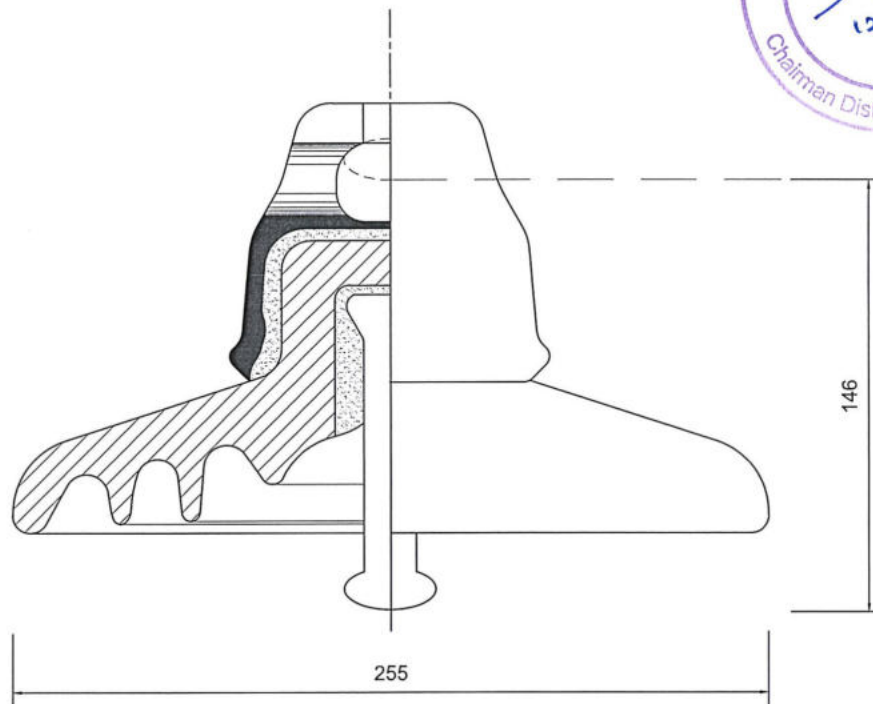


All dimensions are in mm.

 CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	STATION TYPE PORCELAIN POST INSULATOR		DRAWN : LALANI	EDITED : HARSHA
	11 kV & 33 kV		DATE : NOV - 2019	
	REFERENCE IEC PUBLICATION: 60273 (1990)		DRG. NO : DS&S/2019/082/05	
	DESIGNED BY	APPROVED BY	CAD NO :	
	EE (DC)	CHAIRMAN, SPECIFICATION COMMITTEE		

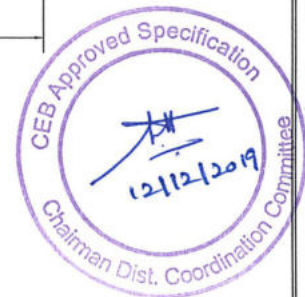


FRONT ELEVATION

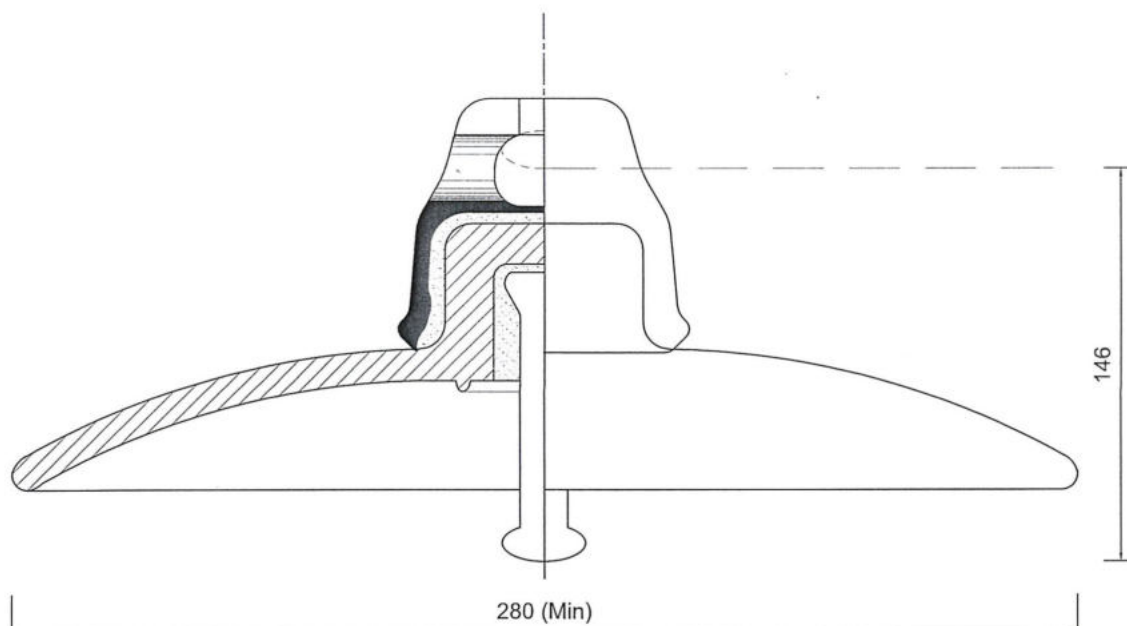


SIDE ELEVATION

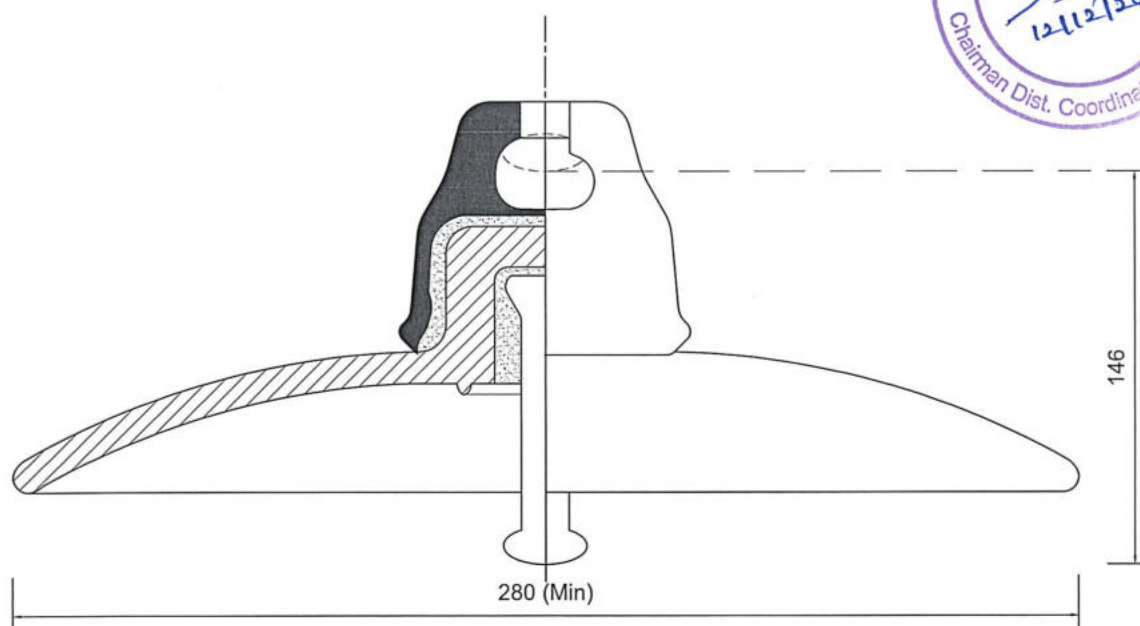
ALL DIMENSIONS ARE IN MILLIMETERS



 CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	PORCELAIN DISC INSULATORS NORMAL PROFILE		DRAWN : LALANI	EDITED : HARSHA
	DESIGNED BY	APPROVED BY	DATE : NOV - 2019	
			DRG. NO : DS&S/2019/082/06	
DISTRIBUTION COORDINATION BRANCH	EE (DC)	CHAIRMAN, SPECIFICATION COMMITTEE	CAD NO :	



FRONT ELEVATION



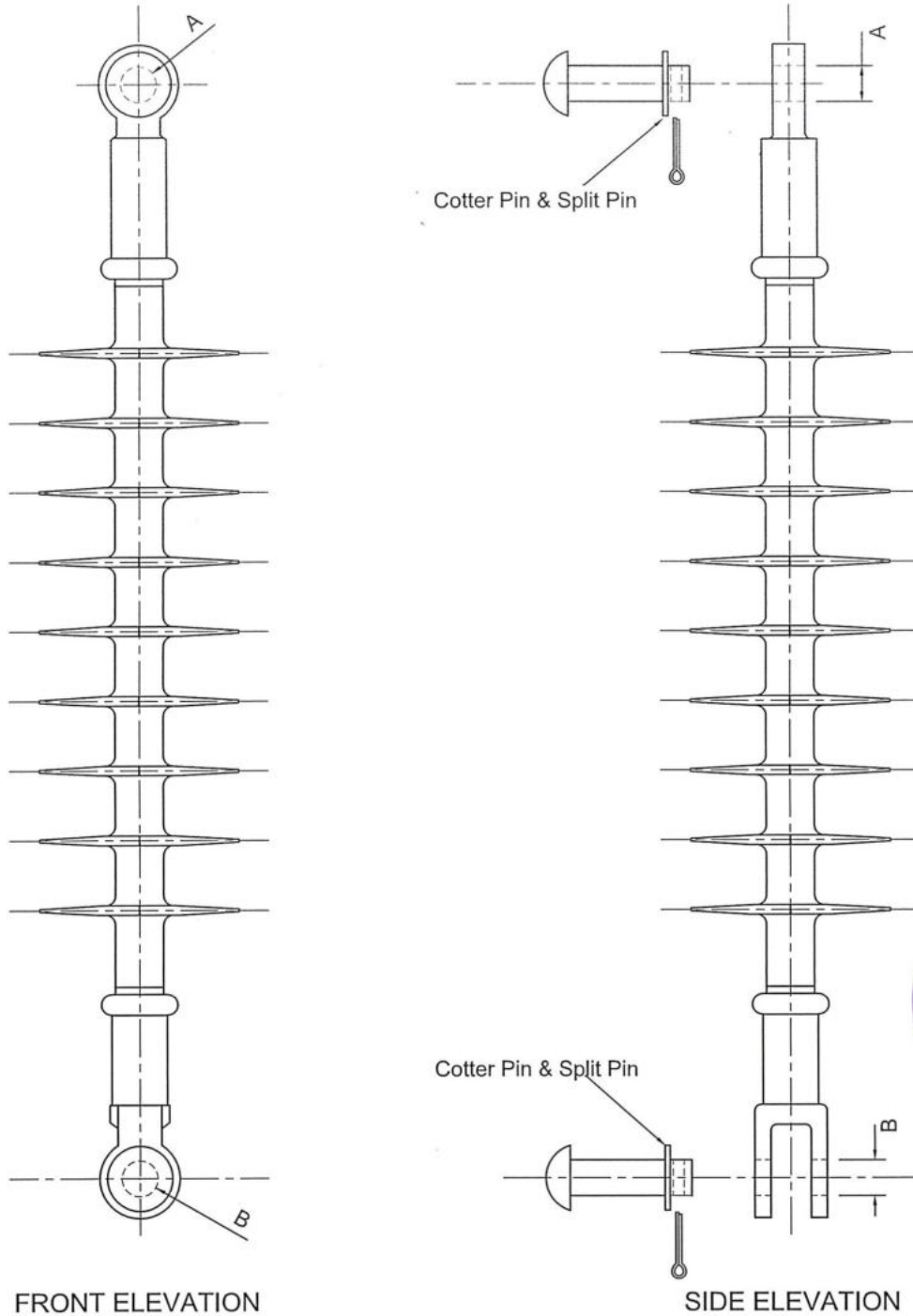
SIDE ELEVATION

ALL DIMMENSIONS ARE IN MILLIMETERS

 CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	PORCELAIN DISC INSULATORS AERODYNAMIC TYPE		DRAWN : LALANI	DRAWN : HARSHA
	DESIGNED BY	APPROVED BY	DATE : NOV - 2019	
			DRG. NO : DS&S/2019/082/07	
			CAD NO :	

EE (DC)

CHAIRMAN, SPECIFICATION COMMITTEE



FRONT ELEVATION

SIDE ELEVATION

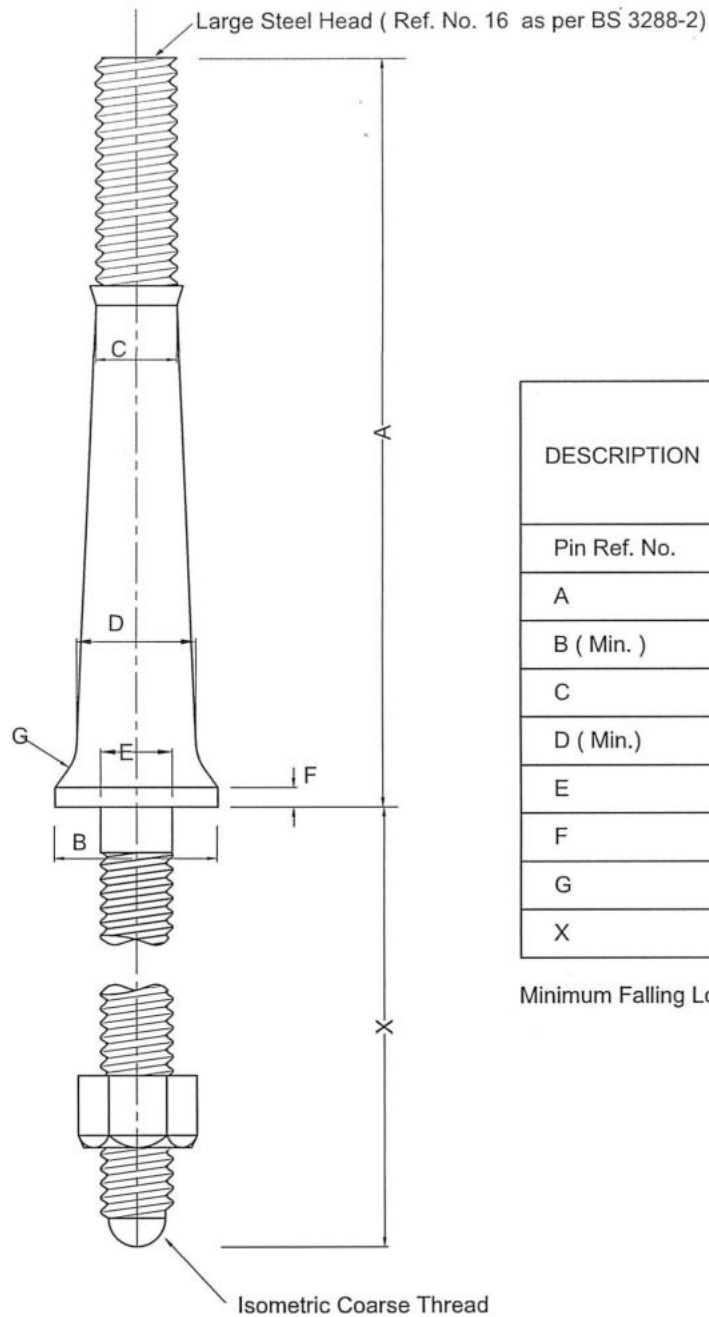
Note:-

* Cotter Pin Diameter for 70kN failing load shall be 16mm and for 120kN it shall be 19mm

* A / B hole sizes should match with hardware in Annexure A10, Annexure A-11, Annexure A12 for respective failing loads

ALL DIMMENSIONS ARE IN MILIMETERS

 CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	SCHEMATIC DIAGRAM OF SILICON RUBBER COMPOSITE INSULATOR		DRAWN : LALANI	EDITED : HARSHA
			DATE : NOV - 2019	
	DESIGNED BY	APPROVED BY	DRG. NO : DS&S/2019/082/08	
	EE (DC)	CHAIRMAN, SPECIFICATION COMMITTEE	CAD NO :	



INSULATOR PIN

DESCRIPTION	INSULATOR PIN	
	11 kV	33 kV
Pin Ref. No.	29	31
A	230 mm	305 mm
B (Min.)	50 mm	63 mm
C	25 mm	27 mm
D (Min.)	37 mm	40 mm
E	22 mm	22 mm
F	6 mm	6 mm
G	13 mm	16 mm
X	140 mm	140 mm

Minimum Falling Load 10 kN

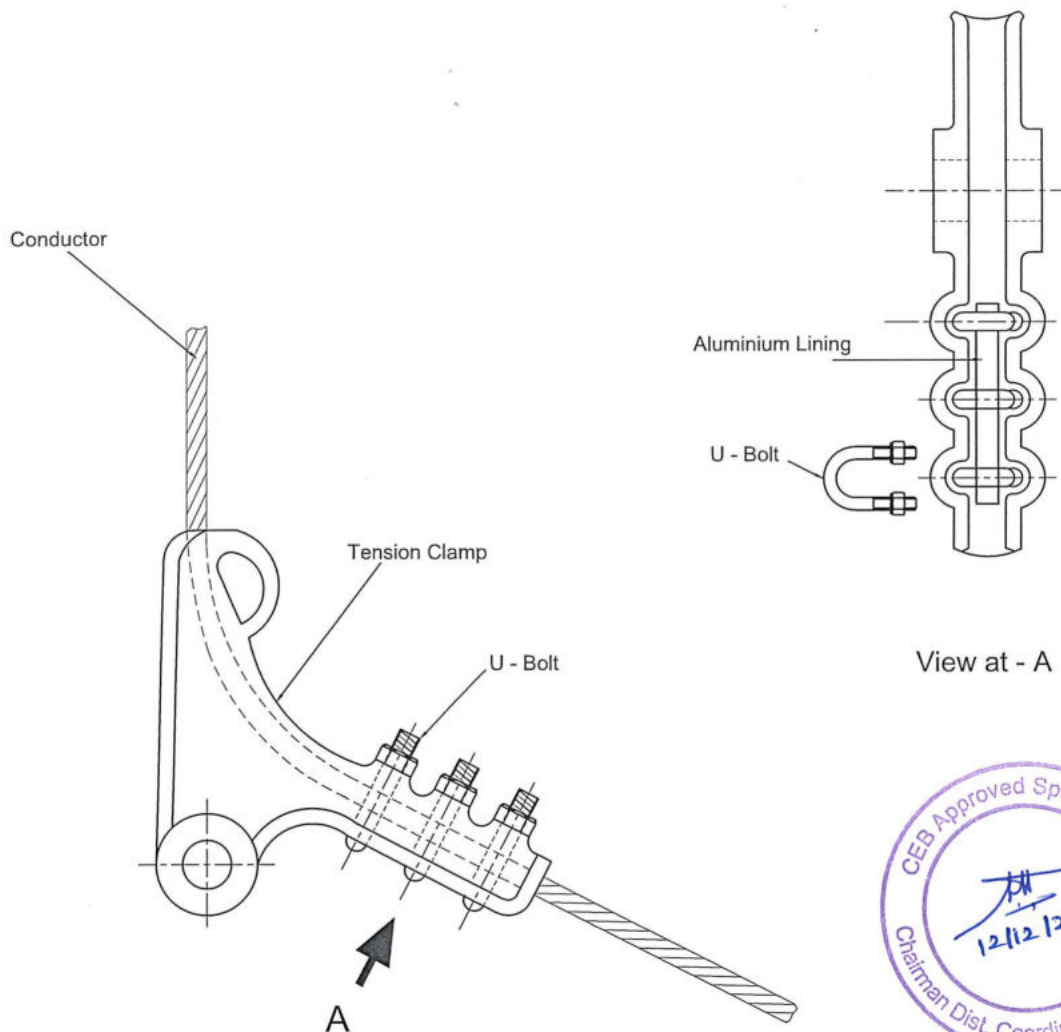


 CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	11kV & 33kV INSULATOR PIN		DRAWN : LALANI	EDITED : HARSHA
	DESIGNED BY		DATE : NOV - 2019	
	APPROVED BY		DRG. NO : DS&S/2019/082/ 09	
	EE (DC)		CAD NO :	

DISTRIBUTION COORDINATION
BRANCH

EE (DC)

CHAIRMAN, SPECIFICATION COMMITTEE

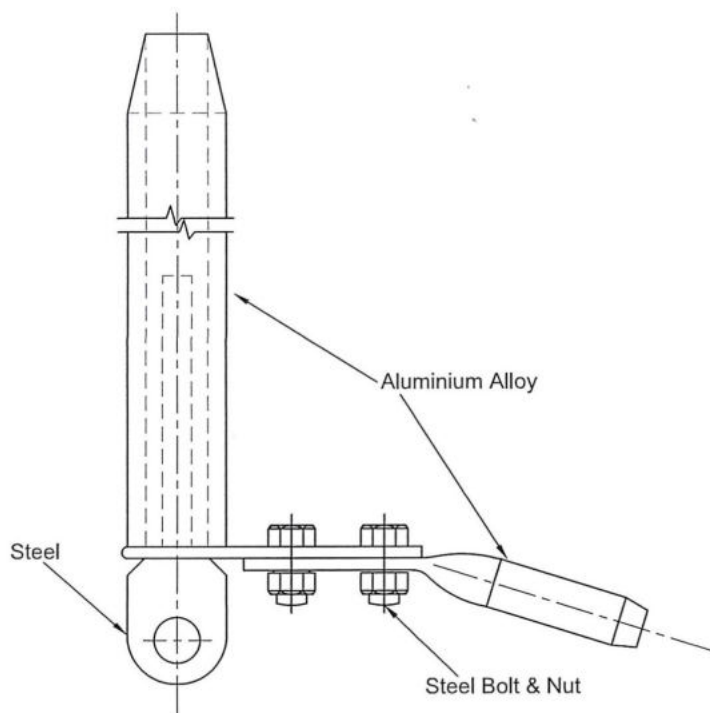


Note:-
Applicable for Item No. (I) & (J) of Clause 1.0
This should match with Socket Eye Ref. No 15/35

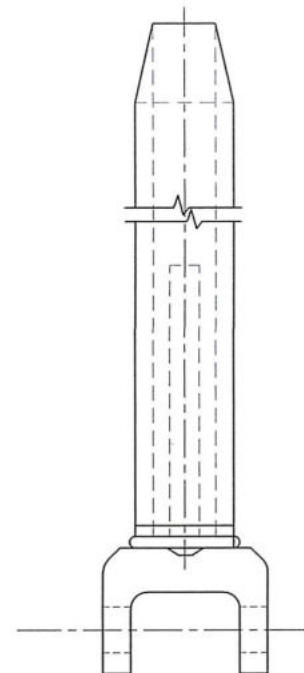
In case of 1.0 (I), Conductor Groove should match
with Racoon Conductors if requested in Price
Schedule

In case of 1.0 (J), Conductor Groove should match
with LYNX / ELM Conductors if requested in Price
Schedule

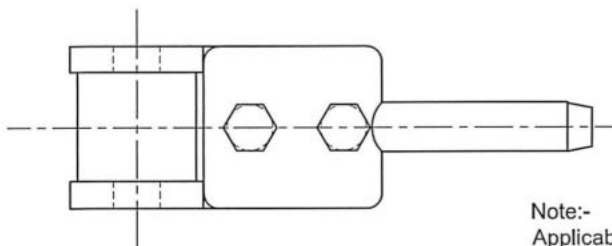
 CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	SCHEMATIC DIAGRAM OF BOLTED TENSION CLAMPS (70kN)		DRAWN : LALANI	EDITED : HARSHA
	DESIGNED BY	APPROVED BY	DATE : NOV - 2019	
			DRG. NO : DS&S/2019/082/10	
			CAD NO :	
	EE (DC)	CHAIRMAN, SPECIFICATION COMMITTEE		



FRONT ELEVATION



SIDE ELEVATION



PLAN VIEW



Note:-

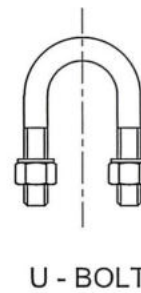
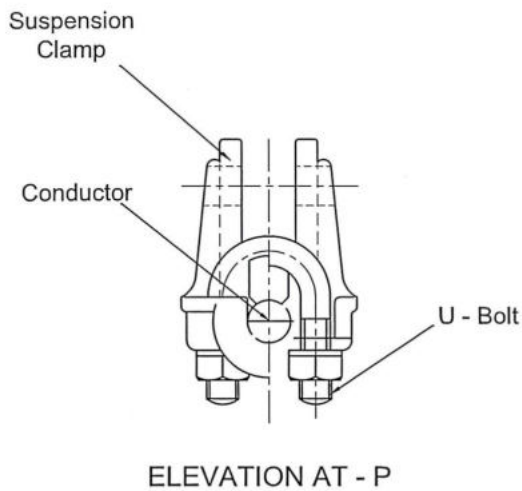
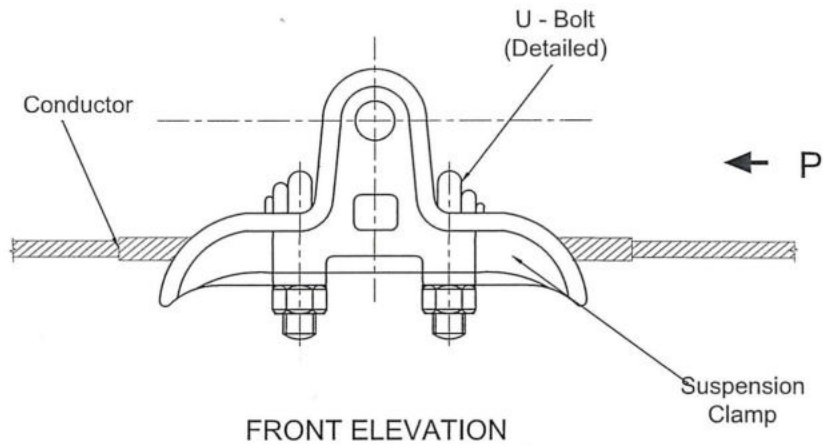
Applicable for Item No. (K), (L) and (M) of Clause 1.0

* This should match with Socket Eye Ref. No. 28/36 A

* If different coupling is offered all required accessories shall be provided to attach to the Socket Eye

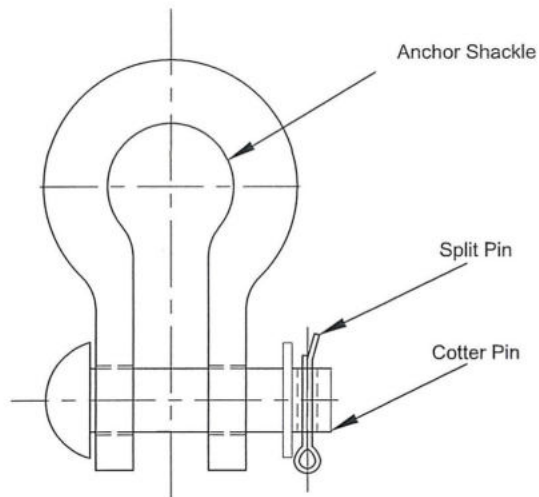
* The Compression Sleeve should match with Racoon / LYNX / ELM/ Zebra conductors as requested in Price Schedule

 CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	SCHEMATIC DIAGRAM OF COMPRESSION CLAMP (120kN)		DRAWN : LALANI	EDITED : HARSHA
	DESIGNED BY	APPROVED BY	DATE : NOV - 2019	
			DRG. NO : DS&S/2019/082/11	
			CAD NO :	
	EE (DC)	CHAIRMAN, SPECIFICATION COMMITTEE		

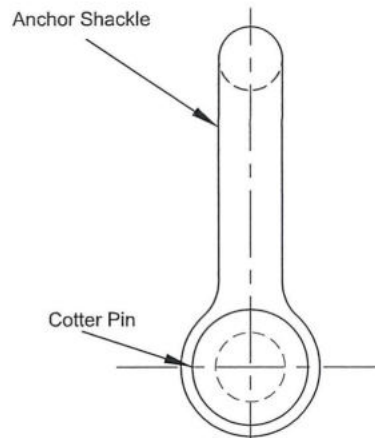


Note:-
This should match with the Socket Eye
Ref. No. 15/35 of BS 3288-2

 CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	SCHEMATIC DIAGRAM OF SUSPENSION CLAMP (70 KN)		DRAWN : LALANI	EDITED : HARSHA
	DESIGNED BY	APPROVED BY	DATE : NOV - 2019	
			DRG. NO : DS&S/2019/082/12	
			CAD NO :	
	EE (DC)	CHAIRMAN, SPECIFICATION COMMITTEE		



Front Elevation

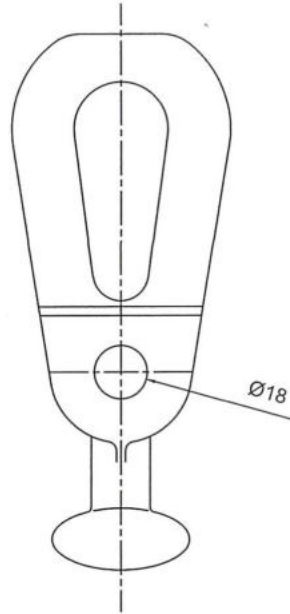


Side Elevation

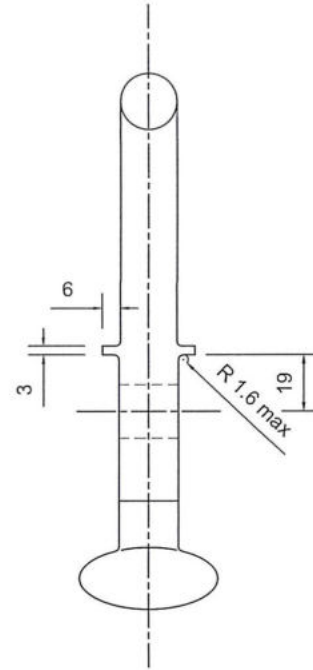


Minimum failing load (kN)	Ref. No. as per Bs 3288-2
70	15/29A or 15/33A
120	28/29A

 CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	SCHEMATIC DIAGRAM OF ANCHOR SHACKLE FOR COMPOSITE AND PORCELAIN TYPE INSULATORS (Reference Standard: BS3288-2)		DRAWN : LALANI	EDITED : HARSHA
	DESIGNED BY	APPROVED BY	DATE : NOV - 2019	
			DRG. NO : DS&S/2019/082/13	
			CAD NO :	
	EE (DC)	CHAIRMAN, SPECIFICATION COMMITTEE		



FRONT ELEVATION



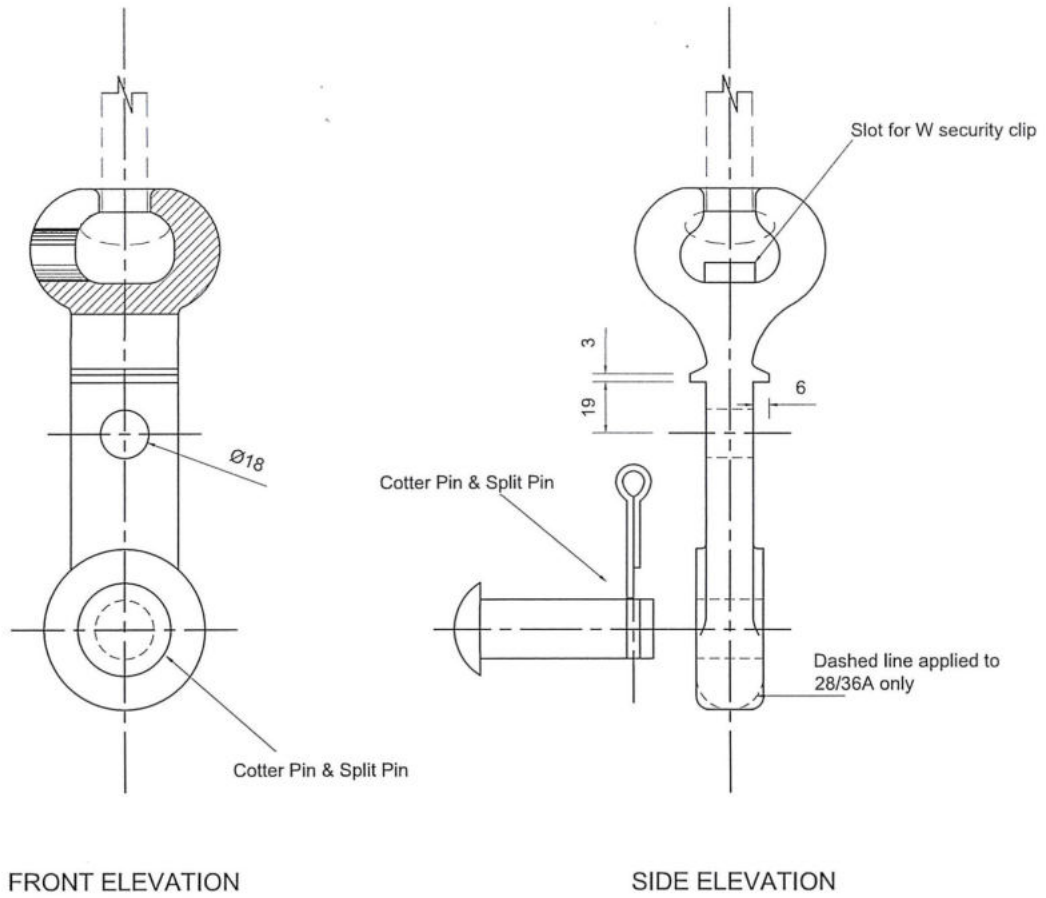
SIDE ELEVATION

Minimum failing load (kN)	Ref No. as per BS 3288-2
70	15/30
125	28/30



ALL DIMENSIONS ARE IN MILLIMETERS

 CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	SCHEMATIC DIAGRAM OF BALL EYE (Reference Standard: BS 3288-2)		DRAWN : LALANI	EDITED : HARSHA
	DESIGNED BY	APPROVED BY	DATE : NOV - 2019	
			DRG. NO : DS&S/2019/082/14	
	EE (DC)	CHAIRMAN, SPECIFICATION COMMITTEE	CAD NO :	



Minimum failing load (kN)	Ref. No. as per BS 3288-2	Cotter Pin size (mm)
70	15/35	16
120	28/36A	20



ALL DIMMENSIONS ARE IN MILLIMETRES

CEYLON ELECTRICITY BOARD DISTRIBUTION COORDINATION BRANCH	DISTRIBUTION STANDARDS & SPECIFICATIONS		SCALE : NOT TO SCALE	
	SCHEMATIC DIAGRAM OF SOCKET EYE (Reference Standard: BS 3288-2)		DRAWN : LALANI	EDITED : HARSHA
	DESIGNED BY	APPROVED BY	DATE : NOV - 2019	
			DRG. NO : DS&S/2019/082/15	
			CAD NO :	

Annex – B1

SCHEDULE OF TECHNICAL REQUIREMENTS AND GUARANTEED TECHNICAL PARTICULARS

(This schedule shall be duly filled by the Manufacturer for each type of insulator offered for applicable parameters)

Properties of Material used for Insulators

a)	Type		Porcelain	Silicon Rubber	Toughened Glass
b)	Chemical Composition				
c)	Porosity	Volume %			
d)	Bulk density	g/cm ³			
e)	Fatigue strength	N/mm ²			
f)	Tensile strength	N/mm ²			
g)	Impact strength	N/mm ²			
h)	Modules of elasticity	Gpa			
i)	Mean Coefficient of linear thermal expansion	10 ⁻⁶ K ⁻¹			
j)	Resistance to thermal shock	K			
k)	Breakdown voltage	kV/mm			
l)	Dielectric constant	tan δ			
m)	Resistivity	Ωm			

.....
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

(This schedule shall be duly filled by the Manufacturer for each type of insulator offered)

(For Pin, Pin Post Insulators and Station Post /Applicable for item A, B & D)

		Offered
1.	Type of the insulator offered	
2.	Item Designation as per the Clause 1.0	
3.	Name of the manufacturer	
4.	Country of origin	
5.	Rated voltage applicable	kV
6.	Rated frequency	Hz
7.	Applicable standards	
8.	Type of insulator material	
9.	Type of thimble material	
10.	Rated withstand Voltages	
	(a) Lightning Impulse	
	(i) Positive Peak	kV
	(ii) Negative Peak	kV
	(b) 1 Minute Power Frequency	
	(i) Wet	kV
	(ii) Dry	kV
	(c) Power frequency flash-over voltages	
	(i) Wet	kV
	(ii) Dry	kV
11.	Total creepage distance	mm
12.	Creepage factor	
13.	Minimum failing load	kN
14.	Applicable size of conductor (indicate the range of sizes of conductors) / bus bar size	mm
15.	Radio interference noise level at standard test voltage	dB
16.	Dry arcing distance of the complete units	mm
17.	Overall height of the complete unit	mm
18.	Minimum ratio of shed spacing to shed overhang	
19.	Type of galvanizing & thickness of coating	
20.	Colour of glazing/insulator	
21.	Whether Pin Post Insulator supplied complete with necessary hardware such as steel pin, nuts and washers?	Yes/No
22.	Whether the dimensional drawings of the item offered furnished?	Yes/No
23.	Total weight	kg



24.	Whether a certified copy of ISO 9001:2015 or latest furnished with the offer?	Yes/No	
25.	Whether the entire Type Test Certificates in accordance with clause 6.3 furnished with the offer?	Yes/No	
26.	Whether markings provided as per clause 11.2?	Yes/No	
27.	Whether the information requested in clause 7 furnished with the offer?	Yes/No	

.....
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



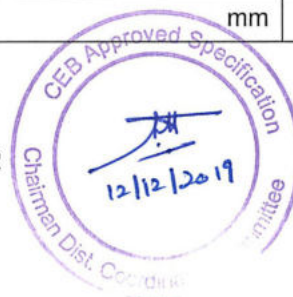
Annex – B3

SCHEDULE OF TECHNICAL REQUIREMENTS AND GURANTEED TECHNICAL PARTICULARS

(This schedule shall be duly filled by the Manufacturer for each type of insulator offered)

(For Disc Insulator Units of Normal and Aerodynamic Profile /Applicable for item E & F)

		Offered
1.	Profile type of the disc insulator offered	
2.	Item Designation as per the Clause 1.0	
3.	Name of the manufacturer	
4.	Country of origin	
5.	Rated voltage applicable	kV
6.	Rated frequency	Hz
7.	Applicable standards	
8.	Type of insulator material	
9.	Porcelain diameter	mm
10.	Insulator spacing	mm
11.	Type of thimble material	
12.	Rated withstand Voltages	
	(a) Lightning Impulse	
	(i) Positive Peak	kV
	(ii) Negative Peak	kV
	(b) 1 Minute Power Frequency	
	(i) Wet	kV
	(ii) Dry	kV
	(c) Power frequency flash-over voltages	
	(i) Wet	kV
	(ii) Dry	kV
13.	Total creepage distance	mm
14.	Creepage factor	
15.	Minimum failing load	kN
16.	Size of the ball & socket coupling	
17.	Thickness of zinc sleeve	mm
18.	Purity of zinc sleeve	%
19.	Zinc sleeve fused area	%
20.	Whether W-Clips provided along with the insulator	Yes/No
21.	Thickness of the W-Clip	mm
22.	Radio interference noise level at standard test voltage	dB
23.	Dry arcing distance of the complete units	mm



24.	Overall height of the complete unit	mm	
25.	Type of galvanizing & thickness of coating		
26.	Colour of glazing/insulator		
27.	Whether the dimensional drawings of the item offered furnished?	Yes/No	
28.	Total weight	kg	
29.	Whether a certified copy of ISO 9001:2015 or latest furnished with the offer?	Yes/No	
30.	Whether the entire Type Test Certificates in accordance with clause 6.3 furnished with the offer?	Yes/No	
31.	Whether markings provided as per clause 11.2?	Yes/No	
32.	Whether the information requested in clause 7 furnished with the offer?	Yes/No	

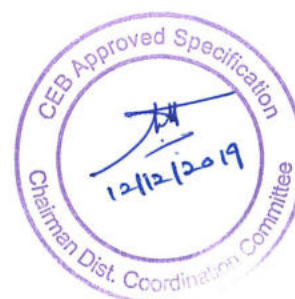
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Signature of the Manufacturer and seal

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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



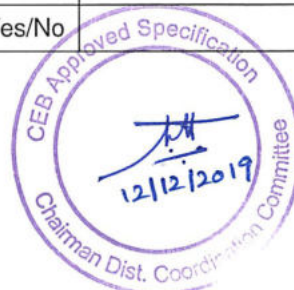
Annex – B4

SCHEDULE OF TECHNICAL REQUIREMENTS AND GURANTEED TECHNICAL PARTICULARS

(This schedule shall be duly filled by the Manufacturer for each type of insulator offered)

(For Composite Pin Post and Tension Insulators/ Applicable for item C & G)

		Offered
1.	Type of the insulator offered	
2.	Item Designation as per clause 1.0	
3.	Name of the manufacturer and country of origin of:	
	(a) Core Rod	
	(b) Housing/ Whethershed	
	(c) Composite insulator	
4.	Model/Reference/Catalogue number	
5.	Rated voltage applicable	kV
6.	Rated frequency	Hz
7.	Applicable standards	
8.	Material of:	
	(a) Core	
	(b) Housing and weathersheds	
	(c) Sealing material	
9.	Rated withstand Voltages	
	(a) Lightning Impulse	
	(i) Positive Peak	kV
	(ii) Negative Peak	kV
	(b) 1 Minute Power Frequency	
	(i) Wet	kV
	(ii) Dry	kV
	(c) Power frequency flash-over voltages	
	(i) Wet	kV
	(ii) Dry	kV
10.	Total creepage distance	mm
11.	Creepage factor	
12.	Minimum failing load	kN
13.	Applicable size of conductor (indicate the range of sizes of conductors)	mm
14.	Radio interference noise level at standard test voltage	dB
15.	Dry arcing distance of the complete units	mm
16.	Overall length of the complete unit	mm
17.	Whether requirement no. of cotter pins and split pins provided?	Yes/No



18.	Minimum ratio of shed spacing to shed overhang	
19.	Type of galvanizing & thickness of coating if applicable	
20.	Colour of insulator	
21.	Whether the dimensional drawings of the item offered furnished?	Yes/No
22.	Total weight	
23.	Whether a certified copy of ISO 9001:2015 or latest furnished with the offer?	Yes/No
24.	Whether the entire Type Test Certificates in accordance with clause 6.3 furnished with the offer?	Yes/No
25.	Whether markings provided as per clause 11.2?	Yes/No
26.	Whether Design Test Certificates in accordance with clause 6.4 furnished with the offer?	Yes/No
27.	Whether the information requested in clause 7 furnished with the offer?	Yes/No

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Annex – B5

SCHEDULE OF TECHNICAL REQUIREMENTS AND GURANTEED TECHNICAL PARTICULARS

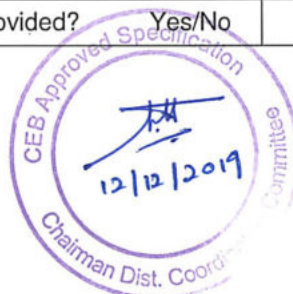
(This schedule shall be duly filled by the Manufacturer for offered insulator hardware fitting as applicable. If there are multiple manufacturers each should fill the schedule separately)

(For Insulator Hardware Fittings/ Applicable for item H, I, J, K, L, M, N, O, P,Q)

		Offered
1.	General Information	
	a) Name of the manufacturer	
	b) Country of origin	
	c) Whether a certified copy of ISO 9001:2015 or latest furnished with the offer? Yes/No	
	d) Whether the entire Type Test Certificates in accordance with clause 6.3 furnished with the offer? Yes/No	
2.	Pins for 11kV/33kV Pin Insulators	
	a) Item Designation as per the Clause 1.0	
	b) Applicable standards	
	c) Rated Voltage kV	
	d) Reference no. as per BS 3288-2	
	e) Shank length mm	
	f) Screwed length mm	
	g) Minimum failing load kN	
	h) Whether required nuts & washers provided? Yes/No	
	i) Whether the dimensional drawings of the item offered furnished? Yes/No	
	j) Type of galvanizing & thickness of coating mm	
	k) Total weight kg	
3.	Bolted Clamps (Shackle Gun) for Tension Insulator Sets	
	a) Item Designation as per the Clause 1.0	
	b) Applicable standards	
	c) Material composition used	
	d) Reference no. as per BS 3288-2	
	e) No of U bolts included	
	f) Type of conductor which can be accommodated (Raccoon / Lynx / Elm)	
	g) Minimum failing load kN	
	h) Whether the dimensional drawings of the item offered furnished? Yes/No	
	i) Total weight kg	
4.	Crimped Type Clamps for Tension Insulator Sets	
	a) Item Designation as per the Clause 1.0	



	b) Applicable standards	
	c) Material composition used	
	d) Reference no. as per BS 3288-2	
	e) Single part fitting or two part fitting as per clause 5.9?	
	f) Type of conductor which can be accommodated (Raccoon / Lynx / Elm / Zebra)	
	g) Minimum failing load	kN
	h) Whether the dimensional drawings of the item offered furnished?	Yes/No
	i) Total weight	kg
5.	Suspension Clamps	
	a) Item Designation as per the Clause 1.0	
	b) Applicable standards	
	c) Material composition used	
	d) Reference no. as per BS 3288-2	
	e) Type of conductor which can be accommodated (Raccoon / Lynx / Elm / Zebra)	
	f) Minimum failing load	kN
	g) Whether the dimensional drawings of the item offered furnished?	Yes/No
	h) Total weight	kg
6.	Anchor Shackle, Socket Eye and Ball Eye with Accessories	
	a) Applicable standards	
	b) Material composition used	
	c) Anchor Shackle	
	i. Reference no. as per BS 3288-2	
	ii. Minimum failing load	
	iii. Whether required cotter pins and split pins provided?	Yes/No
	d) Socket Eye	
	i. Reference no. as per BS 3288-2	
	ii. Standard coupling size	
	iii. Minimum failing load	
	iv. Whether required W-Clips provided?	Yes/No
	v. Thickness of W-Clip	mm
	vi. Whether required cotter pins and split pins provided?	Yes/No
	e) Ball Eye	
	i. Reference no. as per BS 3288-2	
	ii. Standard coupling size	
	iii. Minimum failing load	
	iv. Whether required cotter pins and split pins provided?	Yes/No



	f) Whether the dimensional drawings of the items offered furnished?	Yes/No	
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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

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Signature of the Manufacturer

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Date

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