Technical Specification of Disc Insulator

DETAILS OF DISC INSULATORS:

The Insulator strings shall consist of standard discs for use in three phases. 50 Hz effectively earthed 33/132/220 KV transmission system of AEGCL in a moderately polluted atmosphere. The discs shall be cap and pin, ball and socket type. Radio interference data and have characteristics as shown in Table- I and all ferrous parts shall be hot dip galvanized as per the latest edition of IS 2629. The zinc to be used for making sleeves shall be 99.95 % pure.

The size of disc insulator, minimum creepage distance the number to be used in different type of strings, their electromechanical strength and mechanical strength of insulator string along with hardware shall be as follows:

PRINCIPAL PARAMETERS OF THE DISC INSULATORS:-

Sl. No.	Type of String.	Size of disc. Insulator (mm)	Minimum creepage distance of each disc (mm),	No. of standard discs 132 KV /220 KV/400kV	Electro- mechanical strength of insulator string fittings (KN)
1.	Single suspension	255 x 145	320	1x9/1x14 /-	70 KN/90 KN Normal Disc Insulator
2.	Double suspension.	-do-	-do-	2x9/2x14 /-	70 KN/90 KN Normal Disc Insulator
3	Single suspension	255 x 145	430	1x9/1x14 /-	70 KN/90 KN Antifog Insulator
4	Double suspension.	-do-	-do-	2x9/2x14 /-	70 KN/90 KN Antifog Disc Insulator
5.	Single Suspension	280 x 145	430	1x10/1x15 /-	120 KN Anti fog Disc insulator
6.	Double suspension	280 x 145	430	2x10/2x15 /-	120 KN Anti fog Disc insulator
7.	Single Tension	305 X 170	475	1x10/1x15/1x25	160 KN Anti fog Disc insulator
8.	Double Tension	305 X 170	475	2x10/2x15/2x25	160 KN Anti fog Disc insulator
9.	**Single Suspension**	**280 x 145**	**430**	**1x10/1x15/1x25**	**120 KN Anti fog Disc insulator**
10.	Double suspension	280 x 145	430	2x10/2x15/2x25	120 KN Anti fog Disc insulator

SPECIFICATION DRAWINGS:

: The Specification in respect of the disc insulators are described, the specification is for information and guidance of the bidder only. The drawings to be furnished by the supplier shall be as per his own design and manufacture and in line with the specification.

Porcelain glaze:

The finished porcelain shall be glazed in brown colour. The glaze shall cover all exposed parts of the insulator and shall have a good lusture, smooth surface and good performance under the extreme weather conditions of a tropical climate. It shall not crack or chip by ageing under the normal service conditions. The glaze shall have the same coefficient of expansion as of the porcelain body throughout the working temperature range.

METAL PARTS:

Cap and Ball Pins:

Ball pins shall be made with drop forged steel caps with malleable cast iron. They shall be in one single piece and duly hot dip galvanized. They shall not contain parts or pieces joined together welded, shrink fitted or by any other process from more than one piece of materials. The pins shall be of high tensile steel, drop forged and heat-treated. The caps shall be cast with good quality black heart malleable cast iron and annealed. Galvanizing shall be by the hot dip process with a heavy coating of zinc of very high purity. The bidder shall specify the grade composition and mechanical properties of steel used for caps and pins. The cap and pin shall be of such design that it will not yield or distort under the specified mechanical load in such a manner as to change the relative spacing of the insulators or add other stresses to the shells. The insulator caps shall be of the socket type provided with nonferrous metal or stainless- steel cotter pins and shall provide positive locking of the coupling.

Security Clips:

The security clips shall be made of phosphor bronze or of stainless steel.

FILLER MATERIAL:

Cement to be used, as a filler material be quick setting, fast curing Portland cement. It shall not cause fracture by expansion or loosening by contraction. Cement shall not react chemically with metal parts in contact with it and its thickness shall be as small and as uniform as possible.

MATERIALS DESIGN AND WORKMANSHIP:

GENERAL:

All raw materials to be used in the manufacture of these insulators shall be subject to strict raw material quality control and to stage testing/ quality control during manufacturing stage to ensure the quality of the final end product. Manufacturing shall conform to the best engineering practices adopted

in the field of extra high voltage transmission. Bidders shall therefore offer insulators as are guaranteed by them for satisfactory performance on Transmission lines.

The design, manufacturing process and material control at various stages be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish elimination of sharp edges and corners to limit corona and radio interference voltages.

INSULATOR SHELL:

The design of the insulator shells shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. Shells with cracks shall be eliminated by temperature cycle test followed by mallet test. Shells shall be dried under controlled conditions of humidity and temperature.

METAL PARTS:

The pin and cap shall be designed to transmit the mechanical stress to the shell by compression and develop uniform mechanical strength in the insulator. The cap shall be circular with the inner and outer surfaces concentric and of such design that it will not yield or distort under loaded conditions. The head portion of the pinball shall be suitably designed so that when the insulator is under tension the stresses are uniformly distributed over the pinhole portion of the shell. The pinball shall move freely in the cap socket either during assembly of a string or during erection of a string or when a string is placed in position.

Metal caps shall be free from cracks, seams, shrinks, air holes, blowholes and rough edges. All metal surfaces shall be perfectly smooth with no projecting part or irregularities, which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stress uniformly. Pins shall not show any microscopically visible cracks, inclusions and voids.

GALVANIZING:

All ferrous parts, shall be hot dip galvanized in accordance with IS: 2629. The zinc to be used for galvanizing shall conform to grade Zn 99.95 as per IS: 209. The zinc coating shall be uniform, smoothly adherent, reasonably light, continuous and free from impurities such as flux, ash, rust stains, bulky white deposits and blisters. Before ball fittings are galvanized, all die flashing on the shank and on the bearing surface of the ball shall be carefully removed without reducing the designed dimensional requirements.

CEMENTING:

The insulator design shall. Be such that the insulating medium shall not directly engaged with hard metal. The surface of porcelain and coated with resilient paint to offset the effect of difference in thermal expansions of these materials. High quality Portland cement shall be used for cementing the porcelain to the cap & pin.

SECURITY CLIPS (LOCKING DEVICES)

The security clips to be used as locking device for ball and socket coupling shall be „R■ shaped hump type to provide for positive locking of the coupling as per IS: 2486 (Part-IV). The legs of the security clips shall allow for spreading after installation to prevent complete withdrawal from the socket. The locking device shall resilient corrosion resistant and of sufficient mechanical strength. There shall be no possibility of the locking device to be displaced or be capable of rotation, which placed in position, and under no circumstances shall it allow separation of insulator units and fittings. „W■ type security clips are also acceptable. The hole for the security clip shall be counter sunk and the clip shall be of such design that the eye of the clip may be engaged by a hot line clip puller to provide for disengagement

under energized conditions. The force required for pulling the clip into its unlocked positions shall not be less than 50 N (5 kg.) or more than 500 N (50 kgs.).

MARKING:

Each insulator shall have the rated combined mechanical and electrical strength marked clearly on the porcelain surface. Each insulator shall also bear symbols identifying the manufacturer, month, and year of manufacture. Marking on porcelain shall be printed, not impressed, and shall be applied before firing

BALL AND SOCKET DESIGNATION:

The dimensions of the ball and sockets for 70 and 90 KN insulator strings shall be of 16 mm and for 120 KN and 160 KN insulator strings shall be of 20 mm designation in accordance with the standard dimensions stated in IS: 2486 (Part-II).

9.-DIMENSIONAL TOLERANCE OF INSULATOR DISCS:

It shall be ensured that the dimensions of the disc insulators are within the limits specified below:

Sl. No.	Diameter of Disc (mm)	Standardin Mm	Maximum	Minimum
1.	70 KN/90 KN & 120 KN	255/255 & 280	As per IS	As per IS
2.	160 KN	305	As per IS	As per IS
(b)				
Sl. No.	Ball to Ball spacing Between Discs (mm)	Standardin Mm	Maximum	Minimum
1.	70 KN/90 KN/120 KN	145	As per IS	As per IS
2.	160 KN	170	As per IS	As per IS

NOTE: Tolerance as per relevant IS (Latest edition).

GUARANTEED TECHNICAL PARTICULARS FOR ANTIFOG DISC INSULATORS

Sl. No.	DESCRIPTION	70 KN	90 KN	120KN	160 KN
1.	Manufacture■s name &address				
2	Type of Insulator	Ball & Socket	Ball & socket	Ball & socket	Ball & socket
3	Size of ball & socket	16B	16B	20	20
4	Dimensions				
(a)	Disc diameter	255	255	280	305
(b)	Unit spacing	145	145	145	170
(c)	Creepage distance of the single insulator-mm	430	430	430	475

5	Electro-mechanical strength of single insulator-kN	70	90	120	160
6	Materials of shell	Porcelain	Porcelain	Porcelain	Porcelain
7	Electrical value				
7.1	Power frequency Withstand Voltage Disc				
	(a) Dry-kV (rms)	80	80	85	90
	(b) Wet-kV (rms)	45	45	50	50
7.2	Power frequency Flashover Voltage Disc				
	(a) Dry-kV (rms)	85	85	90	95
	(b) Wet-kV (rms)	50	50	55	55
7.3	Impulse Withstand Voltage Disc				
	1.2/50 micro second				
	(a) Positive – kV(Peak)	125	125	130	135
	(b) Negative – kV(Peak)	125	125	130	135

5	Electro-mechanical strength of single insulator-kN	70	90	120	160
7.4	Impulse Flashover Voltage Disc				
	1.2/50 micro second				
	(a) Positive – kV(Peak)	135	135	140	145
	(b) Negative – kV(Peak)	130	130	135	140

INTERCHANGEABILITY:

The insulators inclusive of the ball and socket fittings shall be of standard design suitable for use with hardware fittings of any make conforming to relevant Indian Standards.

CORONA AND RIV PERFORMANCE:

All surfaces shall be even, smooth, without cuts, abrasions or projections. No part shall be subject to excessive localized pressure. The metal parts and porcelain shall not produce any noise-generating corona under all operating conditions

SUITABILITY FOR LIVE LINE MAINTENANCE:

The insulator shall be compatible for use with hot line or live line maintenance techniques so that usual hot line operation can be carried out with easy speed and safety.

FREEDOM FROM DEFECTS:

Insulators shall have none of the following defects:

Ball pin shake.

Cementing defects near the pin like small blow holes, small hair cracks lumps etc.

Sand fall defects on the surface of the insulator.

INSULATOR STRINGS:

TYPE AND RATING:

The insulator strings shall be formed with standard discs described in this specification for use on 3 phases 132/220 KV 50 Hz effectively earthed systems in an atmosphere with pollution level as indicated in project synopsis. Suspension insulator strings for use with suspension/tangent towers are to be fitted with discs 70/90 KN EMS rating while tension insulator strings for use with Anchor/ Tension towers are to be fitted with discs of 120 KN / 160 KN EMS level rating.

STRING CHARACTERISTICS

The characteristics of the complete string shall be as follows:

Sl. No.	Description.	Suspension.	Tension.		
		132KV	220kV	132KV	220KV
I	Switching surge withstand voltage (dry& wet) KV Peak	-	-	-	-
Ii	Lighting impulse withstand voltage (dry) KV Peak.	650	1050	650	1050
Iii	Power frequency without voltage (wet) KV r.m.s.	275	460	275	460
Iv.	Corona extinction voltage level KV rms	-	176	-	176
v.	Max. RIV for comp. Etc. strong including corona rings at 156 KV (rms). … hours clamps etc. at 1.1. times maximum knee to ground voltage (micro volts).	-	500	-	500

Sl. No.	Description.	Suspension.	Tension.		
vi.	Mechanical failing load for each string (kgf)	6500	11500	11500	15500
Vii.	No deformation load for each string (kgf)	-	7705	-	10385
Viii.	Max. voltage across any disc.	13%	13%	13%	13%

Insulator units after assembly shall be concentric and coaxial within limits as permitted by Indian Standards.

The strings design shall be such that when units are coupled together there shall be contact between the shell of one unit and metal of the adjacent unit.