



MAHAVITARAN
Maharashtra State Electricity Distribution Co. Ltd.

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SPECIFICATION NO. MSEDCL/C.E.(Stores)/MSC-III/02/2011(060711)

TECHNICAL SPECIFICATIONS

FOR

H. T. DISC INSULATORS

TECHNICAL SPECIFICATION FOR 11 KV 45 KN / 70 KN DISC INSULATORS
SPECIFICATION NO.MSEDCL/C.E. (Stores)/MSC-III/HT Disc Ins:02/2011 (060711)

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TECHNICAL SPECIFICATION FOR 11 KV 45 KN / 70 KN DISC INSULATORS
SPECIFICATION NO. MSEDCL/C.E.(Stores)/MSC-III/HT Disc Ins: 02/2011(060711)

1. SCOPE:

This specification covers the manufacture, testing and works supply and delivery of 11 KV Disc insulators. The Porcelain insulators shall conform to IS:731-1971 amended upto date. Insulators shall be of Ball & Socket type.

2. SERVICE CONDITIONS :

The insulators to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

2.1.1	Maximum ambient temperature (Degree C)	...	50
2.1.2	Minimum ambient temperature (Degree C)	...	3.5
2.1.3	Relative Humidity (%)	...	10 to 100
2.1.4	Maximum Annual Rainfall (mm)	...	1450
2.1.5.	Maximum Wind pressure (kg/m.sq.)	...	150
2.1.6	Maximum wind velocity (km/hour)	...	45
2.1.7	Maximum altitude above mean sea level (meter)	...	1000
2.1.8	Isoceraunic level (days/year)	...	50
2.1.9	Seismic level (Horizontal acceleration)	...	0.3 g
2.1.10	Moderately hot and humid tropical climate conductive to rust and fungus growth		

3. SYSTEM PARTICULARS :

a) Nominal System Voltage	11 KV
b) Corresponding highest system Voltage	12 KV
c) Frequency	50 Hz with 3% tolerance
d) Number of phase	3
e) Neutral earthing	effectively grounded.
f) Min. Impulse withstand voltage	75 KV

4. STANDARDS:

Unless otherwise specified elsewhere in the specifications insulators shall conform to the latest revisions of all relevant standards available at the time of placement of the order. The standards are as listed in annexure 'D'.

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5. GENERAL REQUIREMENTS :

5.1 The Porcelain insulators shall generally conform to IS:731-1971 and any amendments up to date to the same .

5.2 Conductors :

The Disc Insulators will be used on lines on which the conductors will be A.A.A. Conductor of size up to 200 sq. mm. and ACSR of any size up to Panther (0.2 sq. inch copper equivalent). The insulators should withstand the conductor tension, the reversible wind load as well as the high frequency vibrations due to wind.

5.3 Type

5.3.1 Insulator shall be suitable for both the suspension and strain type of load & shall be of ball and socket type. The insulators shall conform to Type 'B' of IS:731-1971.

5.3.2 Diameter of porcelain disc insulator shall be 255mm except for 70KN Anti fog type Disc Insulators. Diameter of 70 KN Anti fog type Disc. Insulators shall be 280 mm. The center to center distance between ball & socket shall be 145mm.

5.3.3 Insulator Ends.

Disc Insulators shall have `Ball and Socket' ends. The security clips will have to be provided as per fig. 25 of I.S. 2486 (Part-2) 1989 (amended up to date).

5.3.4 The colour of the units shall be brown for 45 KN Disc Insulators & Greenish for 70 KN Disc Insulators for identification .

5.3.5 The number of units to be used both on suspension and tension strings shall be as given below :

Voltage Class	Suspension	Strings	Tension	Strings.
	Single	Double	Single	Double
33	3	3x2	3	3x2
22	2	2x2	2	2x2
11	1	1x2	1	1x2

5.4. Electromechanical & Mechanical Strength :

The mechanical and electromechanical strength of the individual and the complete Disc shall be as specified below :

The ball and socket will generally conform to IS:2486 - Part-II /1989.

For ready reference major are reproduced below :

Failing Load	Pin Balls(mm)	Socket(mm)
45 KN	16	16
70 KN	16	16

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The accuracy and Alternative `B` of these shall be checked with the corresponding `GO` and `NO GO` gauge.

5.5 Creepage Distances :

The minimum creepage distance for each disc Insulator shall as mentioned below.

Voltage	Creepage Distance 45 KN		Creepage Distance 70 KN	
	Normal	Anti fog	Normal	Anti fog
11 kv	230 mm	320 mm	320 mm	430 mm

5.6 Interchangeability :

The insulator together with the ball and sockets fittings shall be of standard design suitable for use with the hardware of any other indigenous make conforming to relevant standards referred above.

6.0 TESTS :

Suitable number of individual units and complete string shall be subject to the following tests in accordance with IS: 731/1971 with its latest amendments.

6.1 Type Tests :

Following Type test shall be carried out on porcelain insulators as specified in IS: 731 / 1971 amended up to date.

1. Visual Examination.
2. Verification of dimensions.
3. Visible Discharge Test.
4. Impulse voltage withstand test.
5. Impulse voltage flashover test.
6. Wet one Minute Power Frequency withstand test and West Flashover test.
7. Temperature Cycle test.
8. Electromechanical failing load test.
9. Power frequency puncture withstand test.
10. Porosity test.
11. Galvanizing test.

6.3 Acceptance Tests:

The test samples after having withstood the routine test shall be subject to the following acceptance tests in order indicated below:

1. Verification of dimensions.
2. Temperature Cycle test.
3. Twenty four hour mechanical test.
4. Electromechanical failing load test.
5. Power Frequency puncture withstand test.
6. Porosity test.
7. Galvanizing test.

6.4 Routine Tests:

1. Visual Examination.
2. Mechanical test.
3. Electrical test.
4. Twenty four hours mechanical test.
5. Electro mechanical failing load test.

7 **TEST CERTIFICATE:**

The tenderer shall furnish detailed type test reports of the offered Disc Insulators as per clause 6.1 of the Technical Specifications at the NABL approved laboratories to prove that the Disc Insulators offered meet the requirements of the specification. These Type tests should have been carried out within five years prior to the date of opening of this tender. However, the tenderers who have supplied the Disc Insulators to M.S.E.D.C.L./ erstwhile M.S.E.B. against purchase order shall be exempted from submission of type test reports against this tender, provided.

i) The offered Insulators are already fully type tested at Laboratories accredited by the National Accreditation Board of Testing and Calibration Laboratories (NABL) within five years prior to the date of opening of the tender.

ii) There is no change in the design of type tested Disc Insulators and those offered against this tender.

iii) Such tenderers complying (i) and (ii) above shall furnish an undertaking in the format scheduled 'F' enclosed herewith.

The detailed type test reports along with the certified drawings etc. or undertaking seeking exemption from their submission in the format schedule 'F', are to be submitted along with the offer. The purchaser reserve the right to demand repetition of some or all the Type Tests in presence of purchaser's representative at purchaser's cost. For this purpose, the tenderer shall quote unit rates for carrying out each Type Test. However, such unit rates will not be considered for evaluation of the offer. In case the unit fails in the type tests, the complete supply shall be rejected. The successful tenderer shall take approval/waiver of type tests from C.E. (Stores), M.S.E.D.C.L. Prakashgad, Bandra, Mumbai, prior to commencement of supply.

8. **TESTING FACILITIES :**

The tenderer must clearly indicate what testing facilities are available in the works of the manufacturer and whether facilities are adequate to carry out all Routine & acceptance Tests. These facilities should be available to Board's Engineers if deputed or carry out or witness the tests in the manufacturer works. If any test cannot be carried out at the manufacturer's work, the reasons should be clearly stated in the tender. The insulators shall be tested in accordance with the procedure detailed in IS-731/1971 amended up to date.

9. **MATERIAL QUALITY AND WORKMANSHIP:**

The quality of porcelain and hardware in case of porcelain insulators and core & housing in case of polymeric insulators shall be of the highest grade and best workmanship such as is suitable and customary for extra high tension lines and shall

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conform to current IS or IEC (only in absence of the relevant I.S.S.).

The porcelain shall be sound, free from defect, thoroughly vitrified and smoothly glazed and brown in colour.

Unless otherwise specified the glaze shall cover all exposed porcelain parts of the insulator.

Glazing shall be uniform and free from defects. Small and isolated defects in the insulator glaze of a total surface less than 0.5 sq.cm. will however be ignored. Deviation on this account may be supported by relevant IS.

10 MECHANICAL DESIGN :

The design shall be such that stresses due to expansion and contraction in any part of insulator shall not lead to deterioration.

Cement used in manufacture of the insulators shall not cause fracture due to expansion or loosening due to contraction.

11. DRAWINGS :

The tender shall be accompanied with the detailed drawings showing the dimensions of the individual Disc, Ball & Socket, complete strings giving all the design dimensions of various component parts. The drawing for Insulators should clearly show the method of cementing the porcelain to the metal caps and balls. Generally it shall be as per IS.

12. RETEST AND REJECTION:

12.1 **C-2.1** Sample Procedure for testing of insulators shall be as per Appendix 'C' of IS-731/1971 for Acceptance & Routine Tests.

All the insulators selected at random according to col. 1 & 2 of Table 5 of IS-731/1971 shall be subjected to dimensions and temperature cycle tests. The insulators failing to satisfy either of requirements shall be termed as defectives. The lot shall be considered as conforming to these requirements if the number of defectives found in the sample is less than or equal to corresponding acceptance number given in col. 4 of Table 5. The lot shall be rejected if the number of defectives in the same lot is greater than or equal to the first rejection number (r_1) given in col. 5.

If the number of defectives is between the acceptance number and the first rejection number, a second sample of the same size (see col. 3 of Table 5) shall be selected from the lot at random and subjected to these tests. The number of defectives in the first sample and second sample shall be combined. If the combined number of defectives is less than the second rejection number (r_2) given in col. 6 of Table 5, the lot shall be considered as confirming to these requirements. Otherwise the lot shall be rejected without further testing.

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C-2.2 The lot which has been found as confirming to the above requirements shall then be divided into two parts, as shown in col. 7 and 9 of Table 5. The number of insulators to be tested for mechanical, electromechanical and porosity tests shall be in accordance with col. 7 of Table 5. The lot shall be considered as confirming to these requirements if no defective is found in the sample and shall be rejected if there are two or more defectives. If there is one defective, a second sample of the same size (see col.8 of Table 5) shall be selected at random and subjected to the tests. The lot shall be considered as confirming to these requirements if no defective is found in the second sample; otherwise the lot shall be rejected without further testing.

C-2.3 The lot which has been found as confirming to the above requirements of C-2.1 shall then be tested for galvanizing test and puncture test. For this purpose, the sample size is given in col. 9 of Table 5. The lot shall be considered as confirming to these requirements if no defective is found in the sample and shall be rejected if two or more defectives are found in the sample. If there is one defective, a second sample of the same size (see col. 10 of Table 5) shall be selected at random and subjected to the tests. The lot shall be considered as confirming to these requirements if no defective is found in the second sample; otherwise the lot shall be rejected without further testing.

The lot shall be considered as conforming to the requirements of acceptance tests if conditions in C-2.1,C-2.2 and C-2.3 are satisfied.

13. MARKINGS :

13.1 Each insulator shall be legibly and indelibly marked to show the following :

- a) Name or trade mark of the manufacturer.
- b) Voltage & Type
- c) Month and year of manufacturing.
- d) Electromechanical strength in KN.
- e) 'MSEDCL' marking.

13.2 The "W" clip shall be marked with/punched with the ball and socket sizes for which it is meant e.g.16B,20 etc.

13.3 Marking on porcelain shall be printed and shall be applied before firing.

14 PACKING :

All insulators shall be packed in crates or boxes suitable for rough handling. Packing shall be marked with the strength and KV rating.

15 GUARANTEED TECHNICAL PARTICULARS:

The tenderer shall furnish in the form attached (Schedule 'A') all the guaranteed technical particulars.

Annexure 'D'
List of standard Applicable

Sr.No.	Particulars	Specified Standard with latest amendments
1.	Specifications for porcelain Insulators for overhead power lines with nominal voltage greater than 1000V	IS : 731 / 1971
2.	Metal fittings of insulators for overhead lines.	IS : 2486 Part -1 / 1993
3.	Dimensional Requirements for insulators fittings	IS : 2486 Part -2 / 1989
4.	Locking devices	IS : 2486 Part -3
5.	Test for locking devices	IS : 2486 Part -4
6.	Method of High Voltage Testing	IS : 2071 Part -1 ,2 & 3
7.	Dimensions of Disc Insulators	IS : 3188
8.	Testing of uniformity of coating of zinc coated articles.	IS : 2633 / 1986
9.	Zinc ingot specification	IS : 209 / 1992

GUARANTEED TECHNICAL PARTICULARS REQUIREMENTS

Sr. No.	Guaranteed Particulars	11 KV	11 KV	11 KV	11 KV
		45 KN Normal 230 mm	45 KN Anti fog 320 mm	70 KN Normal 320 mm	70 KN Anti fog 430 mm
1.	Working Voltage	11 KV	11 KV	11 KV	11 KV
2.	Highest System Voltage	12 KV	12 KV	12KV	22 KV
3.	Impulse withstand voltage kv (peak)	75 KV	75 KV	75 KV	75 KV
4.	Impulse flashover voltage kv (peak) (+ve 1.2/50 wave)	95 KV	95 KV	95 KV	95KV
5.	Impulse flashover voltage kv (peak) (-ve 1.2/50 wave)	95 KV	95 KV	95 KV	95 KV
6.	Dry 1 min. power frequency withstand Voltage kV	35 KV	35 KV	35 KV	35 KV
7.	Wet 1 min. power frequency withstand Voltage kV	35 KV	35 KV	35 KV	35 KV
8.	Puncture withstand Voltage kV.	105 KV	105 KV	105 KV	105 KV
9.	Minimum Failing load KN	45 KN	45KN	70KN	70KN
10.	Min. Creepage Distance mm	230mm	320mm	320mm	430mm
11.	Center to center distance between 'Ball & 'Socket' in mm	145	145	145	145
12.	Diameter of Disc Insulator in mm	255	255	255	280
13.	Diameter of Ball & Socket in mm	16	16	16	16
14.	Colour of Disc Insulator	Brown	Brown	Greenish	Greenish

SCHEDULE – A1

GUARANTEED TECHNICAL PARTICULARS FOR 45 KN NORMAL TYPE DISC. INSULATOR UNIT.

Sr.No	Parameter Name	Parameter type
1.	Name of Manufacturer.	Text
2.	Type of insulator	Text
3.	Material used for insulator housing	Text
4.	Colour of Disc Insulator (Brown)	Text
5.	Diameter of disc insulator in mm	Numeric
6.	Center to center distance between ‘Ball & ‘Socket’ in mm	Numeric
7.	Diameter of Ball & Socket is 16 mm (Y / N)	Boolean
8.	Creepage distance minimum in mm.	Numeric
9.	Working voltage in kV.	Numeric
10.	Highest System Voltage in kV.	Numeric
11.	Impulse Withstand Voltage kV (Peak)	Numeric
12.	Impulse flashover voltage kV (Peak) (+ ve 1.2/50 wave)	Numeric
13.	Impulse flashover voltage kV (Peak) (- ve 1.2/50 wave)	Numeric
14.	Dry 1 min. power frequency withstand Voltage kV.	Numeric
15.	Wet 1 min. power frequency withstand Voltage .kV.	Numeric
16.	Approximate Weight of single disc(Kg)	Text
17.	No. of insulators per crate	Numeric
18.	Packed wt. of each crate (kg)	Numeric

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SCHEDULE – A2

**GUARANTEED TECHNICAL PARTICULARS FOR 45 KN ANTI FOG TYPE
DISC. INSULATOR UNIT.**

Sr.No	Parameter Name	Parameter type
1.	Name of Manufacturer.	Text
2.	Type of insulator	Text
3.	Material used for insulator housing	Text
4.	Colour of Disc Insulator (Brown)	Text
5.	Diameter of disc insulator in mm	Numeric
6.	Center to center distance between ‘Ball & ‘Socket’ in mm	Numeric
7.	Diameter of Ball & Socket is 16 mm (Y / N)	Boolean
8.	Creepage distance minimum in mm.	Numeric
9.	Working voltage in kV.	Numeric
10.	Highest System Voltage in kV.	Numeric
11.	Impulse Withstand Voltage kV (Peak)	Numeric
12.	Impulse flashover voltage kV (Peak) (+ ve 1.2/50 wave)	Numeric
13.	Impulse flashover voltage kV (Peak) (- ve 1.2/50 wave)	Numeric
14.	Dry 1 min. power frequency withstand Voltage kV.	Numeric
15.	Wet 1 min. power frequency withstand Voltage .kV.	Numeric
16.	Approximate Weight of single disc(Kg)	Text
17.	No. of insulators per crate	Numeric
18.	Packed wt. of each crate (kg)	Numeric

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SCHEDULE – A3

GUARANTEED TECHNICAL PARTICULARS FOR 70 KN NORMAL TYPE DISC. INSULATOR UNIT.

Sr.No	Parameter Name	Parameter type
1.	Name of Manufacturer.	Text
2.	Type of insulator	Text
3.	Material used for insulator housing	Text
4.	Colour of Disc Insulator (Greenish)	Text
5.	Diameter of disc insulator in mm	Numeric
6.	Center to center distance between ‘Ball & ‘Socket’ in mm	Numeric
7.	Diameter of Ball & Socket is 16 mm (Y / N)	Boolean
8.	Creepage distance minimum in mm.	Numeric
9.	Working voltage in kV.	Numeric
10.	Highest System Voltage in kV.	Numeric
11.	Impulse Withstand Voltage kV (Peak)	Numeric
12.	Impulse flashover voltage kV (Peak) (+ ve 1.2/50 wave)	Numeric
13.	Impulse flashover voltage kV (Peak) (- ve 1.2/50 wave)	Numeric
14.	Dry 1 min. power frequency withstand Voltage kV.	Numeric
15.	Wet 1 min. power frequency withstand Voltage .kV.	Numeric
16.	Approximate Weight of single disc(Kg)	Text
17.	No. of insulators per crate	Numeric
18.	Packed wt. of each crate (kg)	Numeric

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SCHEDULE – A4

GUARANTEED TECHNICAL PARTICULARS FOR 70 KN ANTI FOG TYPE DISC. INSULATOR UNIT.

Sr.No	Parameter Name	Parameter type
1.	Name of Manufacturer.	Text
2.	Type of insulator	Text
3.	Material used for insulator housing	Text
4.	Colour of Disc Insulator (Greenish)	Text
5.	Diameter of disc insulator in mm	Numeric
6.	Center to center distance between 'Ball &'Socket' in mm	Numeric
7.	Diameter of Ball & Socket is 16 mm (Y / N)	Boolean
8.	Creepage distance minimum in mm.	Numeric
9.	Working voltage in kV.	Numeric
10.	Highest System Voltage in kV.	Numeric
11.	Impulse Withstand Voltage kV (Peak)	Numeric
12.	Impulse flashover voltage kV (Peak) (+ ve 1.2/50 wave)	Numeric
13.	Impulse flashover voltage kV (Peak) (- ve 1.2/50 wave)	Numeric
14.	Dry 1 min. power frequency withstand Voltage kV.	Numeric
15.	Wet 1 min. power frequency withstand Voltage .kV.	Numeric
16.	Approximate Weight of single disc(Kg)	Text
17.	No. of insulators per crate	Numeric
18.	Packed wt. of each crate (kg)	Numeric

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SCHEDULE - ' C '

SCHEDULE OF TENDERER'S EXPERIENCE

Tenderer shall furnish here a list of similar orders executed / under execution by him to whom a reference may be made by Purchaser in case he considers such a reference necessary.

SR. NO.	NAME OF CLIENT & DESCRIPTION	VALUE OF ORDER & QUANTITY	PERIOD OF SUPPLY & COMMISSIONING	NAME & ADDRESS TO WHOM REFERENCE MAY BE MADE
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NAME OF FIRM _____

NAME & SIGNATURE OF TENDERER _____

DESIGNATION _____

DATE _____

SEAL & SIGNATURE OF THE TENDERER