

TECHNICAL SPECIFICATION OF 30 KV METAL OXIDE GAPLESS LIGHTNING ARRESTERS (PORCELAIN)

1. SCOPE:-

This specification covers design manufacture assembly, testing at manufacturers works, supply and delivery of single phase outdoor metal oxide type gapless surge arresters for use in effectively earthed system with normal voltage of 33 KV for 30 KV Lightning Arrestors. The rated voltage of Arrestors shall be 30 KV (rms) for 33 KV system.

2. CLIMATIC CONDITIONS:-

Peak ambient temperature	-50°C
Minimum temperature in shade	-4°C
Maximum relative humidity	-95% (sometimes Approached saturation)
Average number of thunderstorms days per annum	- 40 days
Average number of rainy days per annum-	90 days
Maximum wind pressure	- 150 Kg/Meter ²
Average annual rain fall	- 125 cm.
Altitude not exceeding	- 1000 meters

3. SPECIAL CONDITIONS :-

The atmosphere at places is laden with dust in suspension during the dry months and subject to fog in cold months. The temperature variation between the daily minimum and maximum is large. Heavy lightning is usual in the area during the month of May to November. The area is also subjected to heavy monsoon rains 80% to 90% of the annual precipitation during the months of June to October.

4. SYSTEM CONDITIONS :-

- | | | |
|------|------------------------|----------|
| i) | Nominal system voltage | 33 KV |
| ii) | Highest system voltage | 36 KV |
| iii) | Frequency | 50 Hz |
| iv) | Fault level | 1500 MVA |
- (iii) The system is 3 phase 50 Hz solidly grounded system with earth fault protection. The winding of transformer which is to be protected is connected in delta formation.
- (iv) We will place one set of surge arrester at the entry of the each line (feeder) in the substation and one set near to the transformers for 33 KV system.
- (v) The insulation level provided in our transformer is 170 KVP for 33 KV system.

5. STANDARD:-

The surge arresters shall strictly conform to IEC 99-4/IS-3070 Part-3-1993 with latest amendment if any in all respects. Maximum residual voltage shall comply with the requirement given hereunder:-

The surge arrestors meeting any other authoritative standards, which ensure equal or better performance than mentioned above, shall be acceptable.

6. The technical requirement have been detailed out below:-

6.1 The supplier should offer nearest rating of surge arrestors.

6.2 The transformers, which are to be protected having BIL 170 KVP for 33 KV winding. We will be installing our LAs at a distance of 5/10 meters from transformer (another 5 meters be added towards height of LAs, lead length and Bushing of transformers). Considering 20% safe margin as per IEC, the impulse voltage of more than 136 KVP should not appear across the 33 KV side of transformer. .

6.3 Required Technical Particulars:

S. No	Particulars	Requirements
01	Nominal System Voltage	33 KV
02	Type of Arrestor	Metal Oxide
03	Applicable Standard	IEC 99/4 IS-3070(P-3) /1993 with latest amendments
04	Rated arrestor voltage KV rms	30
05	Maximum continuous operating voltage KV rms	24
06	Nominal discharge current (8/20 micro sec) KA	10.0
07	Minimum discharge capability(KJ/KV)	As per long duration discharge class 2 of IEC 99/4
08	Long duration discharge class	2
09	Maximum residual voltage at nominal discharge current of 8/20 micro sec. wave, KV peak.	85
10	Maximum steep current impulse residual voltage at nominal discharge current, KV peak	93
11	Maximum switching impulse residual voltage at 500 Amp. (peak)	70
12	Minimum prospective symmetrical current(KA)	40
13	Impulse high current short duration discharge of 4/10 micro sec. wave (KAP)	100
14	Max. radio interference voltage at 1000 Hz (micro volts)	1000
15	Overall temporary over voltage withstand capacity (KV rms) 1) 1.0 Sec. 2) 10.0 Sec. 3) 100.0 Sec	36 34 32
16	Impulse withstand voltage (KVP)	170
17	Current impulse withstand level	As duty prescribed in line discharge Class-I of IEC TC-37/IS- 3070 (P-III)
18	Pressure relief device	Class "A"
19	Disconnecting device	N.A.
20	Min. creepage distance of	900

	Porcelain housing (mm)	
21	Top & Bottom metal cap	Hot Dip Galvanized
22	Terminal arrangement	Built in clamping type, can be adjusted for Horizontal & Vertical take-off to suit conductor size squirrel to raccoon.
23	Earthing terminal	The base of L.A. shall be provided with two separate terminal/distinctly marked for connection for earthing.

- 6.4** Residual voltage for 8/20 micro sec. wave of nominal discharge current KA are specified above. However, we will prefer still lower residual voltage to ensure better protection.
- 6.5** The requirement of energy is very specific based on our system. The firms are requested to offer nearest energy rating of LAs for both single and double shot.
- 6.6** Current impulse withstand level – duration 1000 micro secs. 30 KV arrestors shall meet the duty prescribed in line discharge class-I of IEC TC-37.
- (C) **Pressure relief device** : - The arrester for 33 KV system should have a suitable pressure relief system in order to avoid damage to its porcelain housing.
- (D) Each and every individual unit of surge arrester shall be hermetically sealed and fully protected against ingress of moisture. Suitable rubber gaskets with effective sealing system should be used. The hermetic seal shall be effective for entire life time to arrestors and under the service conditions specified. The supplier shall furnish sectional view showing details of sealing employed. Manufacturers should device a suitable routine production testing to verify the efficiency of sealing.
- (E) All the units of arrestors of same rating shall be interchangeable type without adversely affecting the performance.
- (F) The lightning (surge) arrester shall be suitable for pedestal type mounting which will be arranged by the purchaser.
- (G) All necessary bolts, nuts, clamps etc., required for mounting on support structure shall be included in the scope of supply.
- (H) All porcelain housing shall be free from lamination cavities and other flaws affecting mechanical and electrical strengths. The porcelain should be non-porous.
- (I) All exposed ferrous parts shall be hot dip galvanized as per IS-2633.
- (J) Line terminal pads and ground terminal pads should be hot dip galvanized.
- 8. TERMINAL CONNECTORS :-**
Terminal connectors shall be manufactured and tested as per IS: 5361 & should be type tested. The terminal connector drawings should be submitted separately with the tender documents.
- a. All casting shall be free from blowholes, surface blisters, cracks and cavities. All sharp edges and corners shall be blurred and rounded off.
- b. All current carrying parts shall be designed and manufactured to have minimum contact resistance.
- c. The contact surface must be machined smooth to obviate excessive current density.

- d. The terminal connector for connection of conductor should be suitable for squirrel to raccoon conductor with Universal take off arrangement (can be adjusted for both horizontal & vertical take-off) and should have adequate current carrying capacity.
- e. The terminal connector shall be manufactured out of aluminium alloy grade LM 9 or 25 as per IS and by gravity die casting process only.
- 8.6** Terminal connector should have six bolts to hold the conductor and conductor hold length shall be 100 mm approximately. All nuts, washers, bolts etc. shall be stainless steel/hot dip galvanized.
- 8.7** The top metal cap and the base of the Lightning Arrestors shall be galvanized.
- 8.8** The base of the Lightning Arrestor shall be provided with two separate terminals distinctly marked for connection to earth.

(1) **NAME PLATE** :- The arrestors shall be provided with non-corrosive legible name plate fitted rigidly on arrestor body with indelibly marked with the following information :-

1. Chhattisgarh State Power Distribution Co. Ltd..
2. Order No. & date.
3. Manufacturer's name and/or trade mark and identification (serial) No. of the Arrestor.
4. Rated voltage.
5. Maximum continuous operating voltage.
6. Type
7. Rated frequency
8. Nominal discharge current.
9. Long duration discharge class.
10. Pressure relief current in KA rms.
11. B.I.L. of the equipment to be protected
12. Year of manufacture.

The name place should be fitted rigidly so that during life of arrestor, there should not be any possibility of removal of nameplate.

- (2) The supplier shall furnish two sets of following drawings for our approval before commencing the supplies.
- b) General outline drawings of the complete arrestor with technical parameters.
 - c) Drawings showing clearance from grounded and other live objects and between adjacent poles of surge arrestors required at various heights of surge arrestors.
 - d) Drawings showing details of pressure relief devices.
 - e) Mounting clamp details of surge arrestors.
 - f) Details of line terminal and ground terminals.
 - g) Volt time characteristics of surge arrestors.
 - h) The detailed dimensional drawing of porcelain housing such as ID, OD, thickness and insulator details such as height, profile of petticoats, angle of inclination and gap between successive petticoats, total creepage distance etc.
 - i) Name Plate.

(3) TESTS & TEST CERTIFICATES:-

- 11.1** Type Test Certificates:- The complete type test certificate of NABL accredited laboratories i.e. CPRI, ERDA etc. for the LAs of all the types/rating as per IEC 99/4 shall compulsorily be submitted in support of evidence of compliance of the specifications & guaranteed particulars. It should cover all the type tests as prescribed in clause 7.1 IEC 99/4 and IS-3070(Part-III).

NOTE :- Type test report of manufacturer's laboratory shall not be acceptable.

11.2 TYPE TEST

The following type tests shall be made in accordance with Clause 7.1 of IEC 99/4 IS-3070 Part-III. with latest amendments:-

1. Insulation withstand test.
 2. Residual voltage test
 3. Long duration current impulse withstand test
 4. Operating duty test
 5. Pressure relief test
 6. Partial discharge test.
- (B) The following additional tests are to be made in accordance with IS-3070 (Part-II)/ 1985 :-
- (iii) Temperature cycle test on porcelain housing.
 - (iv) Porosity test for porcelain components.
3. Visual Examinations.
- (C) For energy calculation, set of type test reports should be submitted.

11.3 ACCEPTANCE TESTS:-

The following tests as per clause 8.2 of IEC 99/4 and IS-3070 Part-III shall be done on the lower whole number of the cube root of the number of arrestors to be supplied.

- a) Power frequency reference voltage test at reference current on complete arrestors.
- b) Lightning impulse residual voltage test at nominal discharge current on complete arrestors.
- c) Porosity test on porcelain
- d) Partial discharge test.
- e) Galvanising test on exposed steel parts.
- f) Visual/dimensional examination.

11.4 ROUTINE TESTS :- The following routine tests as per clause 8.1 of IEC 99/4/ IS-3070 Part-I/ Part-III are to be conducted by the manufacturer on offered lot for pre-despatch inspection (The lot offered without routine test reports shall not be considered & delay in acceptance of the offer will be on firm's account):-

- a) Measurement of the reference voltage on the complete arrestors.
- b) Residual voltage test at nominal discharge current on the complete arrestors or sections.
- c) Test to verify the efficiency of sealing.

12. INSPECTION :-

12.1 The purchaser's representative shall at all times be entitled to have access to the works and all places of manufacture where equipment/material shall be manufactured and the representative shall have full facilities for unrestricted inspection of the supplier's works raw materials and process of manufacture for conducting necessary tests as detailed herein.

12.2 The supplier shall keep the purchaser informed in advance of the time of starting and of the progress of manufacture of equipment/material in its various stages so that arrangements can be made for inspection.

12.3 No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested, unless the purchaser in writing waives off the inspection. In the later case also, the equipment/material shall be dispatched only after satisfactory testing for all tests specified herein has been completed.

12.4 The acceptance of any quantity of material shall in no way relieve the supplier of any of his responsibilities for meeting all requirements of the specification, and shall not prevent subsequent rejection if such material is later found to be defective.

12.5 The number of sample selected to carry out the acceptance test shall be as per provision in the respective IS.

12.6. The purchaser has the right to have the tests carried out by an independent Agency subject to recovery of testing expenditure in case of failure, whenever there is dispute regarding the quality of supply.

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