



GUJARAT ENERGY TRANSMISSION CORPORATION LTD.

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RACE COURSE, BARODA – 390 007.**

TECHNICAL SPECIFICATIONS FOR

66 kV LIGHTNING ARRESTORS

GETCO/ENGG/TECH SPECI. - 66 KV LA/R6/June-22

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TECHNICAL SPECIFICATION OF 66 kV LIGHTNING ARRESTORS

1.1 SCOPE:

- 1.1.1** This specification covers the design, manufacture, assembly testing at manufacture's works, and delivery of heavy duty station class lightning arrestors, complete in all respects, confirming to modern design and practice for protection of transformers, sub-station equipment's and overhead lines. ***The scope also includes supply of hot dip galvanized support structures as per GETCO drawing attached and if indicated in Schedule - A of respective tender.***

1.2 STANDARDS:

- 1.2.1** The lightening arrestors covered by this specification shall comply with the requirements of latest, edition of IEC publication No. 60099 – 4/2014 Ed3.0 & IS15086(Part-4):2017, except specified, otherwise in the specification. Hollow insulator shall comply with IS/IEC 62155.

- 1.2.2** Lightning Arrestors, meeting the requirements of any other authoritative standards which ensure equal / better quality than that as per the standards mentioned above shall, also, be acceptable. When the lightning arrestor confirms to any other standards, the salient points of difference between the standard adopted and standard given above shall be specifically brought out in the bid for each item of difference.

1.3 DRAWINGS & DOCUMENTS :

The Bidder shall furnish one set of following drawings along with the offer:

- General outline drawings of the complete arrester with technical parameters.
- Drawing showing clearance from grounded and other live objects and between adjacent poles of surge Arresters, required at various heights of surge Arresters.
- Drawing showing details of pressure relief devices.
- Detailed drawing of discharge counters along with the writing and schematic drawing of discharge counter and meter.
- Outline drawing of insulating base.
- Details of grading rings, if used.
- Mounting details of Surge Arresters.
- Details of line terminal and ground terminals.
- Details and dimensions of ZnO block.
- Volt-time characteristics of Surge Arresters.

- Details of galvanizing being provided on different ferrous parts.
- Details of Master name plate and individual unit name plate.
- 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 minimum creep age distance etc.

In the event of an order the bidder has to submit the above drawings in three sets for approval during commencement period and after the approval, the set of approved copies of drawings in hard copy and soft copy (AutoCAD format) shall be sent as follows:

Each consignee ----- 3 sets

Each respective Suptd. Engr. - 2 sets

Chief Engineer (Project)—2 sets

1.3.1 Within fifteen days of the receipt of order, the tenderer shall submit above drawings for the purchaser's approval.

1.3.3 The bidder may submit any other drawing found necessary in addition to the drawings stated above.

1.3.4 **QUALITY ASSURANCE PLAN** :

1.3.4.1 The Bidder shall invariably furnish following information alongwith his offer. Information shall be separately given for offered surge arrester / Items / parts (associated with it) with surge arrester.

1. Statement giving list of important raw materials names of sub-suppliers for the raw material, list of standards according to which the raw material are tested, list of tests, normally carried out on raw material in presence of Bidder's representative, copies of test certificates.
2. Information and copies of test certificates as in (1) above in respect of bought out items.
3. List of manufacturing facilities available.
4. Levels of automation achieved and list of areas where manual processing exists.
5. List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of such tests and inspections.
6. Special features provided in the equipment to make it maintenance free.

7. List of testing equipment available with the supplier for final testing of equipment specified and test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out (If any) from specified test requirements.

1.3.4.2 The successful Bidder shall within commencement period of order submit the following information to the purchaser.

- I) List of raw material as well as brought out accessories and the name of the material as well as brought out accessories and the names of sub-suppliers selected from those furnished along with the offer.
- II) Type test certificates of the raw material and brought out accessories.
- III) Quality assurance plan (QAP) with hold points for purchaser's inspections **shall be submitted with technical bid and in the event of an order for approval**. The QAP and purchaser hold points shall be discussed between the purchaser and the supplier before the QAP is finalized.
- IV) **Field Quality Plan shall be submitted with technical bid and in the event of an order for approval.**
- V) **Operation and Maintenance manuals shall be submitted with technical bid and in the event of an order for approval**

The bidder shall invariably furnish following information along with the offer.

- a) Names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials in presence of supplier's representative, copies of test certificates.
- b) Information and copies of test certificates in respect of bought out accessories.
- c) List of manufacturing facilities available.
- d) Level of automation achieved and lists of areas where manual processing still exists.
- e) List of areas in manufacturing process, where stage inspection is normally carried out for quality control and details of such tests and inspections.

- f) List of testing equipments available with supplier for final testing equipment and test plant limitation if any, vis-à-vis the type, special , acceptance and routine test specified in the relevant standards. These limitations shall be very clearly brought out in the specified test requirement.

1.3.4.3 The successful bidder shall submit the routine test certificates of bought out items and raw materials at the time of routine testing of the fully assembled arrester.

1.4 TYPE :
The metal oxide type lightning arrestors shall be designed to provide maximum possible protection against lightning and switching surges. Supporting insulators, terminal connectors and other components as specified hereafter, shall be provided with arrestors.

The surge arresters shall be of Station Medium Duty (SM)

1.5 DESCRIPTION:

1.5.1 Design & Construction:

1.5.1.1 Arrestors shall be without series gaps as per the requirement along with characteristic of elements.

1.5.1.2 The non-linear resistor blocks shall have non-ageing characteristic and stable thermal properties. The blocks shall preferably be metalised on the flat surface for ensuring good electrical contact.

1.5.1.2.1 The arrestors shall be complete with suitable grading devices, wherever necessary and shall be provided with an insulating base at the bottom. The clamps required to fix the surge counter shall have to be provided with the surge counter.

1.5.2 Each individual component unit of the arrester stack shall have its arrester elements hermetically sealed under dry inert air and fully protected against

ingress of moisture into the arrestor. The details like material, cross section/thickness etc shall be indicated in cross sectional drawing.

- 1.5.2.1 The arrestor, when energized at rated operating voltage, shall not exhibit any visible corona, when viewed in complete darkness.
- 1.5.2.2 All arrestor units shall be provided with pressure relief class 'A' devices, to limit the internal arrestor pressure to obviate explosion or violent shattering of porcelain housing.
- 1.5.2.3 Porcelain Housing :
All porcelain used in or with each arrestor shall be manufactured by the wet process, be free from lamination, cavities or other flaws, affecting mechanical & dielectric strength and shall be vitrified properly and non-porous. The creepage distance along with external surface shall be large enough to ensure that surface contamination which is possible under site condition will not adversely affect the performance of arrestors.
- 1.5.2.4 Pressure Relief Device :
The Arrestor shall be design A type & shall be provided with efficient pressure relief device so as to check bursting of lightning arrestors, in case, excessive gas pressure is built up and in case, it losses its ability to effectively dissipate the energy due to any operation. The tenderer shall submit detailed information and literature on pressure relief class 'A' device of lighting arrestors. Rated Short Circuit Current shall be 40 KA rms.
- 1.5.2.5 Terminal Connectors :
Each lightning arrestor shall be supplied with compression joint type terminal connector suitable for ACSR Conductor *specified in Schedule – A of respective tender*. The bolt and nuts shall be of stainless steel. 2 nos SS washer and 2 SS nuts (including lock nut) for each bolt shall be supplied. Each terminal connector shall be suitable for vertical / horizontal take-off.
- 1.5.3 Galvanizing :
All metal parts exposed to weather and likely to be subjected to corrosion, shall be hot dip galvanized as per IS: 2629 (latest edition). Bolts, Nuts and Washers shall be electro zinc plated.
- 1.5.4 Name Plate :
Each arrestor shall have non-corrosive nameplate, legibly and indelibly marked and securely fixed to it. They shall be provided with the

information as required by relevant standard. The words 'GETCO' shall, also, be punched on it after inspection of lightning arrestor is over.

1.5.5 Surge Counter:

Each lightning arrestors shall be provided with a recording type surge counter with vertical mounting. The installation of surge counter shall have practically no effect on the operation. The number of discharges recorded by the counter shall be visible through inspection window. **The connection of LA to Surge Monitor shall be made from bottom of surge monitor and there shall not be any opening on top of surge monitor. The connecting cable shall be double PVC sheathed stranded copper flexible twin cables of 50 sqmm, duly ferruled by copper lugs on both sides. The length of cable shall be 2 Meter each.**

1.6 SYSTEM VOLTAGE :

Nominal system voltage	Highest System Voltage
66 KV	72.5 KV

1.6.1 Rated Arrestors Voltage :

The rated arrestor voltage shall be as under:-

Normal System Voltage	Arrestor Voltage
66 KV	60 KV

1.6.2 Nominal Discharge Current :

The arrestor shall have a nominal discharge current of 10 kA (8/20 micro-sec) and shall be of heavy-duty station class type with SM designation.

1.6.3 Maximum residual Voltage :

The maximum residual voltage at nominal discharge current of 10 kA with 8/20 micro-second current wave shall not exceed 190 kV (Peak).

1.6.3.1 *Maximum Continuous Operating Voltage:*

The maximum continuous operating voltage shall be 48 kV min.

1.6.3.1 **Maximum Continuous Operating Voltages:**

The maximum continuous operating voltages shall be as per IEC60099-4 cl. 3.2.1.

1.6.3.2 Energy absorption capability shall be 7 in kj/kV. Submit calculation with technical bid. Repetitive charge transfer rating of 1.6C

1.6.4 System Neutral Connection :

The system is an effectively earthed neutral system.

1.6.5 Out door Installation :

All the lightning arrestors shall be suitable for outdoor installation.

- 1.6.6 Altitude :
The lightning arrestors covered in this specification will be installed at an altitude not more than 1000 meters.
- 1.6.7 Special Condition :
Maximum temperature for a few days, in a year, is likely to go to 50°C and humidity during monsoon is likely to reach the value of 95%. The arrestors offered must withstand these climatic conditions without deteriorating effects.
- 1.6.8 The lightning ancestors shall be suitable for 1.2/50 micro-sec lightning impales voltage of 350 kV peak and one minutes power frequency withstand voltage of 140 kV rms.
- 1.6.9 Impulse withstand voltage of equipment's to be protected :
The BIL of transformer and circuit breakers is 350 kV (Peak).
- 1.6.10 Overhead Earth wire:
Solidly grounded overhead Earth wire/s shall be provided for the sub-station and Transmission Lines.
- 1.6.11 Physical data to be supplied for the Arrestors :
Technical and guaranteed particulars in the Appendix – I shall be furnished with the bid. Drawings showing, dimensions, (actual figures), arrangement and clearances (actual figure) required shall, also be furnished. Bid without details against guaranteed particulars will be considered as incomplete offer. List of orders executed for specified rating of, arrestor along with performance reports for the same shall be submitted.
- 1.6.12 Completeness of Equipments:
All fittings and accessories which may not be specifically mentioned in this specification but which are useful or necessary for lightning arrestors shall be deemed to be included in the specifications and shall be furnished by the bidder without extra charges.
- 1.6.13 Cantilever Strength (for 1 minute withstand test) (in kg)-150
- 1.6.14 Maximum deflection at above cantilever load (in mm)-20
- 1.6.15 PCD-262mm
- 1.6.16 **Type Test:**
All the Lightning Arrester offered shall be fully tested for following tests from NABL accredited laboratory shall be carried out in accordance with latest / amended / up to date IS/IEC. The bidder has to submit the all type test reports as stated hereunder for the offered item along with the technical bid. The type test reports from NABL approved laboratory shall not be older than TEN years. Type Test shall be valid as on the last date of submission of bid.

S N	List of Type test reports
	Tests on metal oxide blocks
1	Steep Current Impulse Residual Voltage test
2	Lightning impulse Residual voltage test
3	Switching impulse Residual voltage test
4	Repetitive charge transfer test
5	Operating duty test
6	P. F. voltage v/s time characteristic
7	Reference voltage test
8	Test to verify long term stability under continuous operating voltage
	Tests on Arrester Housing
9	Impulse voltage withstand test on insulator
10	P.F. (Wet) voltage withstand test on insulator
11	Bending moment test
12	Tests on Arrester
13	Artificial pollution test (IEEE-C62.11)
14	Seismic withstand test
15	Short-Circuit Tests
16	Partial Discharge Test
17	Heat Dissipation Behavior verification of test sample.
18	Cantilever test on complete arrester as per requirement of Clause 4.0.
	General
19	STC on Terminal connector (25 kA for 3 sec)
20	Degree of Protection test on counter/surge monitor
21	Uniformity of Zinc coating

IMPORTANT NOTE: In case of non-submission/partial submission or type test reports of which validity is over, bidder shall submit pending type test report/s from NABL accredited laboratory, in the event of an order, before commencement of supply without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid.

1.6.17 Routine Test:

Routine tests shall be carried out by the successful bidder on all complete arrestors and also on proportionate prorated sections as per IEC recommendations. Certified copies of routine test reports shall be submitted to the purchaser for approval along with the acceptance test reports.

The following routine test reports shall be submitted.

S N	List of Routine test reports
1	Measurement of reference voltage
2	Lightning Impulse Residual voltage test
3	Seal leakage check test
4	Partial discharge test
5	Tests on discharge counter
6	Visual / Dimensional check

7	Sealing test: Water dip test at 1.5m depth from top of Surge Arrestor for 30 minutes shall be performed during assembly of Surge Arrestor stacks (followed by other routine tests, i.e. P.D. measurement, reference Voltage, Residual Voltage & IR Measurement). on any one randomly selected sample from every 50 (Fifty) or below nos. of LA offered for inspection, shall be carried out and report shall be submitted.
8	Surge monitors shall be routinely tested for water dip test at 1.5m depth for 30 minutes. No water vapours shall be visible on the monitor glass. on any one randomly selected sample from every 50 (Fifty) or below nos. of LA offered for inspection, shall be carried out and report shall be submitted.

1.6.18 Acceptance test:

The successful bidder has to offer each lot for inspection. The acceptance test & sampling shall be carried out as per 60099-4 Ed:3.0. 2014 & IS 15086(Part-4):2017. The copy of acceptance test report along with the routine test report shall be submitted for approval of the purchaser

SN	List of Acceptance test reports
1	Lightning Impulse residual voltage test on complete arrester / unit of arrester
2	Reference voltage test
3	Seal leakage check test
4	Partial discharge test
5	Visual / Dimensional check
6	Special thermal stability test
7	Galvanization test on metal parts
8	Functional (operational) tests on surge monitor/counter at nominal discharge currents (a) 100 Amps with 8/20 microsecond wave shape. (b) 10 KA with 8/20 microsecond wave shape.
9	Sealing test: Water dip test at 1.5m depth from top of Surge Arrester for 30 minutes shall be performed during assembly of Surge Arrester stacks (followed by other routine tests, i.e. P.D. measurement, reference Voltage, Residual Voltage & IR Measurement).
10	Surge monitors shall be routinely tested for water dip test at 1.5m depth for 30 minutes. No water vapours shall be visible on the monitor glass.

1.6.19 Creepage Distance :

The lightning arrestors are required to be installed in highly polluted atmosphere. Hence the total minimum creepage distance shall be 1810 mm.

1.6.20 All necessary accessories and earthing connection leads between the bottom of the Arrester and the discharge counter shall be in the supplier's scope. The discharge counter shall be so designed that the readings of discharges recorded by the counter and the readings of milliamp meter shall be clearly visible through an inspection window to a person standing on ground. The

minimum height of support shall be 2.5 M. **The live part to plinth level clearance shall be maintained as – 4000 mm. Mounting bolt, Nut, washers etc shall be supplied with each LA.**

1.6.21 **The mounting of LA shall be suitable to GETCO structure. If required necessary MS, HDG 8 mm thick adaptor plate with both PCD drilled in, shall be supplied as a part of supply. The structure drawing is attached herewith.**

SEAL OF THE FIRM

SIGNATURE OF BIDDER

APPENDIX – I**Technical and Guaranteed Technical particulars for 60KV Metal Oxide Arrestors (Gapless type).**

1. Name of manufacturer
2. Type and Model & designation
3. Applicable IS/IEC Reference
4. No. Of Units per phase
- 4.1 Nos. of ZnO blocks per unit**
5. Rated voltage KV rms
- 5.1 System voltage**
6. Max. continuous operating voltage KV rms
7. Nominal discharge current KA
(8/20 microsecond wave)
8. High current discharge capacity KA
(4/10 microsecond wave)
9. Repetitive charge transfer rating C
- 9.1 Energy Absorption in kJ/kV**
10. Max. Residual voltage with KV Peak
(8/20 microsecond wave) at:
Lightning impulse of:
a) 5 KA
b) 10 KA -do-
c) 20 KA -do-

11.	Steep current impulse residual voltage at 10KA with one microsecond front time.	KV peak
12.	Switching impulse residual voltage at 500A with 30 microsecond front time.	KV Peak
13.	One minute PF withstand voltage of arrestor housing	KV rms.
14.	1.2/50 microsecond lightning impulse withstand voltage of arrestor housing.	KV (Peak)
14.a	Over –voltage withstand capability – KV	
	a) 100 Seconds	
	b) 10 seconds	
	c) 1 second	
	d) 0.1 second	
15.	Total minimum creepage distance of arrestor	(mm)
16.	Short Circuit rating	kA
17.	Resistive and capacitive currents of arrestor at continuous operating voltage.	
18.	Reference voltage and current	
19.	Cantilever strength of arrestor	
20.	Weight of complete unit	Kg.
21.	Height of complete unit from base to the line side terminal	mm
22.	Minimum recommended spacing between arrestor centre to centre.	mm

23. Clearance required for grounded, equipment at various height of arrestor unit. mm
24. Whether earthing arrangement provided.
Details shall be given.
25. Dimensional Details for Mounting flange
26. Terminal details of connecting clamp
Suitable for Conductor.
27. Details of porcelain shells :
- a) Make
 - b) Total minimum creepage (mm)
28. **Details of metal oxide block**
- Reference voltages**
- Material**
- Diameter**
- Height**
29. **Details of structure**
- Material**
- Hot dip galvanizing, zinc coating in gms/m²**
- Mounting dimensions**

SEAL OF THE FIRM

SIGNATURE OF BIDDER

NOTE :

1. Instead of giving reference of drawing No. / IS Literature etc. actual values / figures must be furnished wherever required otherwise it will be considered that details in GTP are not furnished and technical bid will be evaluated accordingly.