

**TECHNICAL SPECIFICATION
OF
ELECTRICAL
MATERIALS**

Lightening Arrestor

“GROUP – E”

Tender Notice No. NESCO Utility / O&M Materials/58 / 8267, dtd.17.7.15

GROUP – E

LIGHTNING ARRESTOR

Sl. No.	Item Description	Unit	Qty.
1	11KV Lightning Arrestor(10KA)	No	300
2	33KV Lightening Arrestor(10KA)	No	200

NB: 1. Bidders should put their authorized signature with office seal on each page of the documents.

2. Bidders should put their offer in the Guaranteed particulars column furnished in the tender documents.

3. Purchaser may ask to the bidder who will qualify in Techno- Commercial evaluation of the tenders for submission of Samples for verification , if required.

4. Purchaser reserves the right to increase or decrease the above quantities during placement of purchase order or may cancel any item/items without assigning any reason thereof .

Dy. General Manager (C&P)
NESCO Utility, Balasore, Odisha

11KV (LIGHTNING ARRESTERS)

TECHNICAL SPECIFICATION FOR 9 KV 10 KA STATION CLASS HEAVY DUTY SURGE ARRESTERS (LIGHTNING ARRESTERS)

1.0 SCOPE:

- 1.1 This specification provides for the design, engineering, manufacture, assembly, stage testing, inspection and testing before despatch, packing, forwarding and delivery of Metal Oxide (gapless) Surge Arresters complete with accessories 11 KV system as specified hereunder.
- 1.2 It is not the intent to specify completely herein all the details of design and construction of Surge Arresters, However, Surge Arresters shall conform in all respects to the high standard of design and workmanship and be capable of performing in continuous commercial operation up to Bidder's guarantee in a manner acceptable to Purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any work or material which in his judgment are not in accordance therewith. The Arresters offered shall be complete with all parts, necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of supply, irrespective of whether they are specifically brought out in the commercial order or not.

2.0 STANDARDS:

- 2.1 The Surge Arresters shall conform to the latest editions and amendments available at the time of supply, of the standards listed hereunder:

S. No.	Standard Ref No.	Title
1.	IEC 99-4	Specification Part. 4 for Surge Arresters without gap for AC system.
2	IS:3070 (Part-III)	Specification for Lightning Arresters for alternating current System
3	IS:2629	Recommended practice for hot dip galvanising of iron and steel.
4	IS:2633	Method for testing uniformity of coating on Zinc coated articles.
5	IS:5621	Specification for large hollow porcelain for use in electrical installation.
6	IS:2147	Degree of protection provided by enclosures for low voltage switchgear and control gear.
7.		Indian Electricity Rules 1956.

Note:

- i) For the purpose of this specification all technical terms used hereinafter shall have the meaning as per IEC specification.

ii) For the parameters of the Arrester which are not specified in IEC specification for Surge Arresters, the provisions of ISS 3070 (Part.III) shall be applicable.

2.2 Surge Arresters meeting with the requirements of other authoritative standards, which ensure equal or better quality than the standards mentioned above shall also be acceptable. Where the equipment offered by the Bidder conforms to other standards, salient points of difference between the standards adopted and the specified standards shall be clearly brought out in the offer. Two (2) copies of the reference standards in English language shall be furnished along with the offer.

3.0. CLIMATIC CONDITIONS:

3.1 The Surge Arresters and accessories shall be suitable for continuous satisfactory operation under climatic conditions listed below.

1. Maximum ambient Air Temperature in shade (deg.C).	50 °C
2. Minimum Ambient Air Temperature in shade(deg.C).	(-) 5 °C
3. Maximum daily average ambient air temperature	40°C
4. Maximum relative humidity(%)	100%
5. Height above mean sea level	1000M
6. Maximum wind pressure	260 Kg m ²
7. Average No. of thunder Storm Days / annum.	70 days.
8. Average annual rainfall (mm)	1500 mm
9. Average No. of months of tropical monsoon condition p.a.	4

All the electrical devices shall be given tropical and fungicidal treatment to enable their satisfactory operation in the above climatic conditions.

4.0 PRINCIPAL PARAMETERS:

The Surge Arresters offered under this specification shall conform to the parameters given below.

S. No	Particulars	System parameters for 9 KV Station type
1	Nominal system voltage (kv rms)	11
2	Highest system voltage (kv rms)	12
3	1.2/50 microsecond impulse voltage with stand level	
a	Transformer and reactors (kvp)	75
b	Other equipment and lines (kvp)	75
4	Minimum prospective symmetrical fault current for 1second at Arrester location (KA rms)	10
5	Anticipated levels of temporary over voltage and its duration.	
a	Voltage(p.u.)	1.5
b	Duration(Seconds)	1/10
6	System frequency(Hz)	50 + / - 1.5
7	Neutral Grounding	Effectively earthed
8	Number of Phases	Three
Note	1. 1 p.u. =	$12 \times \sqrt{2} \text{KV peak} / \sqrt{3}$

5.0 GENERAL TECHNICAL REQUIREMENTS:

5.1 The Surge Arresters shall conform to the technical requirements as per Annexure-A.

5.2 The energy handling capability of each rating of Arrester offered, supported by calculations, shall be furnished in the offer.

5.3.1 The Station Type Surge Arresters shall be fitted with pressure relief devices and arc diverting ports and shall be tested as per the requirements of IEC specification for minimum prospective symmetrical fault current as specified in Annexure-A.

5.3.2 The grading ring on each complete Arrester for proper stress distribution shall be provided if required for attaining all the relevant technical parameters.

5.4 PROTECTIVE LEVELS:

The basic insulation levels and switching impulse withstand levels of the lines and equipment to be protected have been specified in clause 4.0, "Principal Parameters".

The protective characteristics of the Arresters offered shall be clearly specified in the schedule of guaranteed technical particulars.

5.6 GENERAL REQUIREMENTS:

- 5.6.1 The materials and components not specifically stated in this specification but which are necessary for satisfactory operation of the equipment are deemed to be included in the scope of supply unless specifically excluded.
- 5.6.2 Unless otherwise brought out separately by the Bidder in the schedule of deviations the Surge Arresters offered shall conform to the specification scrupulously. All deviations from the specification shall be brought out in the schedule of deviations. The discrepancies between the specification and the catalogues or literature submitted as part of the offer shall not be considered as valid deviations unless specifically brought out in the schedule of deviations.
- 5.6.3 Any deviation which has not been specifically brought out in the schedule of deviations of the Bid Proposal Sheets, shall not be given effect to. The deviations brought out in the schedule shall be supported by authentic documents, standards and other references.
- 5.6.4. Each individual unit of Surge Arresters shall be hermetically sealed and fully protected against ingress of moisture. The hermetic seal shall be effective for the entire life time of the Arrester and under the service conditions as specified. The Bidder shall furnish sectional view of the Arrester, showing details of sealing employed.
- 5.6.5 The bidder shall furnish in the offer, a sectional view of pressure relief device employed in the Station type Surge Arresters offered.
- 5.6.6 The Surge Arresters shall be suitable for hot line washing.

5.7 Construction:

- 5.7.1 All the units of Arresters of same rating shall be interchangeable without adversely affecting the performance.
- 5.7.2 The Surge Arresters shall be outdoor and suitable for pedestal/ clamp type mounting.
- 5.7.3 All the necessary flanges, bolts, nuts, clamps etc., required for assembly of complete Arrester with accessories and mounting on support structure to be supplied by the Purchaser shall be included in Bidder's scope of supply.
- 5.7.4 The drilling details for mounting the Arrester on Purchaser's support shall be supplied by the Supplier.
- 5.7.5 The minimum permissible separation between the Surge Arrester and any earthed object shall be indicated by the Bidder in his offer.

5.8. PORCELAIN / POLYMERIC HOUSING:

- 5.8.1 The housing may be of Porcelain or Polymeric.
- 5.8.2 Where the bidders are quoting for Surge Arresters with Porcelain Housing, all porcelain housings shall be free from lamination cavities or other flaws affecting the maximum level of mechanical and electrical strengths.
- 5.8.3 The porcelain shall be well vitrified and nonporous.

5.8.4 The creepage distance of the Arrester housing shall be as per Annexure-A.

5.8.5 The porcelain petticoat shall be preferably of self cleaning type (Aerofoil design).
The details of the porcelain housing such as height, angle of inclination, shape of petticoats, gap between the petticoats, diameter (ID and OD) etc., shall be indicated by the Bidder in his offer in the form of a detailed drawing.

5.8.6 The Arrester housing shall conform to the requirements of IEC specification.

5.9. GALVANISATION, NICKEL PLATING ETC.:

5.9.1. All ferrous parts exposed to atmosphere shall be hot dip galvanised as per IS:2629 as amended from time to time. Tinned copper / brass lugs shall be used for internal wiring. Screws used for electrical connections shall be either made of brass or nickel plated.

5.9.2. Ground terminal pads and name plate brackets shall be hot dip galvanised.

5.9.3 The material shall be galvanised only after completing all shop operations.

5.10. ACCESSORIES AND FITTINGS:

5.10.1 All necessary accessories and earthing connection leads shall be in the Bidder's scope of supply.

5.10.2 Terminal connector conforming to IS: 5561 shall be supplied along with the arrester.

5.11. The grounding terminal shall be suitable for accommodating Purchaser's grounding connection to steel earth mat.

5.12. Name Plate:

The arrester shall be provided with non-corrosive legible name plate indelibly marked with the following information:

1. Purchaser's Name : **NESCO**
2. Order No.:
3. Manufacturer's name, address, trade mark and identification no. of the Arrester being supplied.
4. Rated Voltage.
5. Maximum continuous operating voltage.
6. Type.
7. Rated Frequency.
8. Nominal discharge current.
9. Line discharge class.
10. Pressure relief current in kA rms.
11. B.I.L. of the equipment to be protected.
12. Year of manufacture.
13. Date of despatch.
14. Date of Expiry of Warranty.

6.0. TESTS:

6.1 TEST BEFORE DESPATCH:

The Surge Arrester of various rating and accessories shall be subjected at maker's works before despatch, to the following tests as per relevant standards.

A) ROUTINE TEST ON EACH UNIT AS PER RELEVANT STANDARDS:

1. Measurement of reference voltage.
2. Residual voltage test.
3. Satisfactory absence from partial discharges and contact noises.
4. For arrester units with sealed housing leakage check shall be made on each unit.
5. Current distribution test for multi Column arrester.

6.2 TYPE TESTS:

6.2.1 The bidder shall furnish valid and authenticated type test reports from a Govt. approved / Govt. recognized / NABL Accredited laboratory of similar rating and design of tendered material along with detailed dimensional drawing duly signed & verified by testing agency also showing size & numbers of blocks dimensions contained in the housing along with bid as per requirement of the Tender Specification. Such type test certificates should not be older than 5 years as on the date of bid opening. For this purpose date of conducting type test will be considered. The type test certificates shall be furnished either in original or copy duly attested by notary.

The bidder should furnish documentary evidence in support of the laboratory whose type test have been furnished, that the said laboratory is a Govt. / a Govt. approved / a Govt. recognized / NABL accredited laboratory / ILAC accredited (in case of foreign laboratory).

The bids of only those bidders shall be considered to be meeting the type test criteria who furnishes complete type test certificate with the bid as per above provision.

6.2.2: Following type tests shall be conducted on one unit of each rating as per relevant standard.

1. Insulation withstand test.
2. Residual voltage test.
3. Bending test on arrester housing assembly.
4. Long duration current impulse withstand test.
5. Operating duty test.
6. Pressure relief test (Only for station type)
7. Test of arrester disconnectors (For 9 KV Feeder Type)
8. Artificial pollution test on porcelain.
9. Partial discharge test.
10. Housed arresters.
 - a) Temperature cycle test.
 - b) Porosity test.
11. Galvanising test on exposed ferrous metal parts.
12. Any other type test which are not specified above but covered as per amendment/latest edition of relevant IS/IEC.

6.3 TEST ON BOUGHT OUT ITEMS:

Tests are not required to be performed on bought out equipments/items like, Terminal connector etc. at the works of manufacturer. Furnishing Test Certificate of bought out items from the original equipment manufacturers shall be deemed to be satisfactory evidence. Inspection of the tests at Sub-contractors works will be arranged by the supplier whenever required.

6.4 ROUTINE/ACCEPTANCE TESTS:

The following tests shall be got conducted in presence of purchaser's representative, as per stipulation of the relevant standards. Acceptance tests whenever possible shall be conducted on the complete arrester unit. No. of samples to be selected for acceptance tests shall be nearest lower whole number to the cube root of the number of arresters to be supplied.

1. Measurement of power frequency reference voltage on the complete arrester at the reference current measured at the bottom of the arrester.
2. Lightning Impulse residual voltage.
3. Partial discharge test.
4. Visual inspection & verification of dimension.
5. Special thermal stability test.
6. Galvanising test on Ferrous metal parts.
7. Any other tests as per IS.

6.5 TOLERANCE ON TEST RESULTS:

As per relevant standards/specifications.

6.6. CHECKING AT STORES (TEST AT CTL):

One out of every 50 nos. Surge Arresters will be selected for checking at Store for visual, dimensional, weight, marking etc. as per relevant ISS/GTP/approved drawing.

7.0 INSPECTION:

All the tests (as mentioned at Clause 6.4) and Inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the bidder and purchaser at the time of purchase. The bidder shall afford the inspection officer(s) representing the purchaser all reasonable facilities without charges, to satisfy him that the material is being supplied in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

The Inspection may be carried out by the purchaser at any stage of manufacture/before despatch as per relevant standard.

Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the bidder of his obligation of furnishing material in accordance with the specification and shall not prevent subsequent rejection if the material is found to be defective. The Bidder shall keep the purchaser informed in advance, about manufacturing programme so that arrangements can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance/routine testing of the bought out items.

**GUARANTEED TECHNICAL PARTICULARS FOR METAL OXIDE (GAPLESS)
SURGE ARRESTERS**

S. No.	Particulars	Requirement of parameters	Bidder's offer
1	Name of Manufacturer. & Address	To be specified by the bidder	
2	Location of type testing	To be specified by the bidder	
3	Applicable standard	IS:3070 (Part-III) or the latest version thereof	
4	Normal System Voltage (KV)	11	
5	Rated frequency	50 Hz	
6	Rated arrester voltage (KV)	9	
7	Maximum continuous operating voltage (MCOV) KV (rms)	10	
8	Leakage current through arrester at operating voltage	Less than 1mA	
9	Installation	Outdoor	
10	Class	Station Class	
11	Type of construction	Single column, single phase	
12	Nominal discharge current corresponding to 8 / 20 micro second wave shape (KA peak)	10	
13	Maximum lightning impulse residual voltage with 8 / 20 micro second discharge current peak	32 KV	
14	High current impulse test value (4/10micro-sec. wave)	100KA	
15	Type of mounting	Pedestal	
16	Connection (between phase to earth) / (between phase to phase)	Phase to Earth	
17	Line discharge class	2	
18	Ratio of switching impulse residual voltage to rated voltage of arrester	As per provision of IEC – 99 – 4 (latest amended)	
19	Minimum prospective symmetrical fault current for pressure relief test (KA rms)	40	
20	Terminal connector suitable for the conductor	upto 100 mm ² single	
a)			
b)	Take off	For both vertical & horizontal	
21	Voltage (corona extinction) (KV rms)	Rated voltage of arrester	
22	Partial discharge	As per provision of IEC – 99 – 4 (latest amended)	

23	Whether insulating base and discharge counter with milli ammeter are required	No	
24	Minimum creepage distance of arrester housing	380 mm	
25	Drawing	To be submitted by	

Name & Signature of Bidder with seal

TECHNICAL SPECIFICATION OF 33KV LIGHTNING ARRESTOR

SCOPE

14.1 This Specification provides for the design, manufacture, inspection and testing before dispatch, packing and delivery F.O.R. (destination) of metal oxide (gapless) Surge Arresters with discharge counters, insulating base, terminal connectors and other accessories as specified here in.

Following is the list of documents constituting this Specification. :

(i)	Technical Specification (TS)	
(ii)	Check-List.	Annexure-B
(iii)	Calibration Status of testing equipments and meters/ Instruments.	Annexure-C
(iv)	Check-list towards Type Test Reports.	Annexure-D
Note : Annexure-B,C,& D are to be filled up by the Bidder.		

All the above along with amendments thereof shall be read and interpreted together. However, in case of a contradiction between the Technical Specification and any other volume, the provisions of this volume will prevail.

14.2 The Surge Arrester shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of offer and purchaser shall have the power to reject any work or materials, which in his judgment is not in full accordance therewith.

14.3 STANDARDS:-

Except to the extent modified in the Specification, the Surge Arrester shall conform to the latest editions and amendments of the standards listed hereunder.

Sl. No.	Standard	Title.
1	IEC-99-4	Specification for Surge Arresters without gap for AC
2	IS:2147	Degree of protection, provided by enclosures for low voltage

3	IS:2629	Recommended practice for hot dip galvanization of iron and
4	IS:2633	Method for testing uniformity of coating on zinc coated
5	IS:3070	Specification for surge arresters for alternating current
6	IS:5621	Specification for large hollow porcelain for use in electrical
	& IEC-621155	installation.
7	IEC-60-1	High-Voltage Test technique.
8	IEC-270	Partial discharge measurements.
9	IEC-99-1	Non-linear resistor type gapped arresters for a.c. systems.
10		Indian Electricity Rules, 1956.
11	IEC-60815	Shed profile of hollow porcelain Insulator.

14.4 Surge Arresters with the requirement of other authoritative standards, which ensure equal or better quality than the standards, mentioned above shall also be acceptable. Where the equipment offered by the supplier conforms to other standards, salient points of difference between the standards adopted and the specified standards shall be clearly brought out in the offer. 2 (Two) copies of the reference standards in English language shall be furnished along with the offer.

14.5 GENERAL TECHNICAL REQUIREMENTS:

14.5.1 The Surge Arrester shall confirm the technical requirements

14.5.2 The energy handling capability of each rating of Arrester offered, supported by calculations, shall be furnished with the offer.

14.5.3 The Surge Arresters shall be fitted with pressure relief devices and arc diverting paths and shall be tested as per the requirements of IEC for minimum prospective symmetrical fault current as specified in Appendix-I.

14.5.4 A grading ring shall be provided if required, (for attaining all the relevant technical parameters) on each complete Surge Arrester.

14.6 PROTECTIVE LEVELS:

Surge Arresters shall be capable of providing protection to sub-station equipments, designed for the withstand levels, given in the following table.

Sl.	Equipment to be protected	Insulation Level of 36KV System
		L.I. Level (KVP)
1	Power Transformers.	170
2	Instrument Transformers.	170
3	Reactors	170
4	Circuit Breakers/Isolators.	
(i)	Phase to ground.	170

Surge arrester shall be suitable for the following duty cycles of circuit breaker at the following system voltages:

36 KV Circuit Breaker

0-0.3 sec-co-3 min-co

14.7 DUTY REQUIREMENT:

14.7.1 Surge Arresters shall be of heavy-duty station class and gapless type without any series or shunt gaps.

- i. Surge Arresters shall be capable of discharging over voltages occurring during switching of unloaded transformers, lines, capacitors and reactors.
- ii. The Surge Arresters shall be capable of discharging lightning and switching surges and temporary power frequency over-voltages.
- iii. The Surge Arresters shall be capable of discharging the energy equivalent to class 3 of IEC-99-4.

14.7.2 The reference current of the arrester shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage. The supplier shall submit values and the supporting evidence along with calculations on above.

14.7.3 Surge Arresters shall be fully stabilized thermally to give a life expectancy as per standard under site conditions.

14.7.4 Surge Arresters shall be able to withstand maximum wind load of 260 Kg./sq.m.

14.7.5 Surge Arresters shall be capable of withstanding effects of direct solar radiation

14.7.6 Surge arresters shall be capable of spark over on severe switching Surges and multiple strokes.

14.7.7 The Surge Arrester should be adequately designed to operate satisfactorily under temporary power frequency over-voltage as given in specific technical requirements, after discharging two shots of respective long duration surges.

14.7.8 Unless otherwise brought out separately by the Bidder in the schedule of deviations, the Surge Arresters, offered shall conform to the specification scrupulously. All deviations from the specification shall be brought out in the schedule of deviations. The discrepancies between the specification and the catalogues or literature, submitted as part of the offer shall not be considered as valid deviations unless specifically brought out in the schedule of deviations.

14.8 CONSTRUCTION:

14.8.1 Non linear blocks shall be sintered metal oxide material. These shall be provided in such a way as to obtain robust construction with excellent electrical and mechanical properties even after repeated operations.

14.8.2 All the units of arresters of same rating shall be inter-changeable without adversely affecting the performance.

14.8.3 The Surge Arresters shall be suitable for pedestal type mounting.

- 14.8.4** All the necessary flanges, bolts, nuts, clamps etc. required for assembly of complete arrester with accessories and mounting on support structure to be supplied by the purchaser, shall be included in supplier's scope of supply.
- 14.8.5** The drilling details for mounting the Arrester on owner's support shall be supplied by the supplier.
- 14.8.6** The minimum permissible separation between the Surge Arrester and any earthed object shall be indicated by the Bidder in his offer.
- 14.8.7** Surge Arresters shall be designed to incorporate pressure relief devices and arc diverting paths to prevent shattering of the blocks or the porcelain housing, following prolonged current flow or internal flash over and providing path for flow of rated fault currents in the event of arrester failure.
- 14.8.8** Surge Arresters shall incorporate anti-contamination feature to prevent arrester failure, caused by uneven voltage gradient across the stack, resulting from contamination of the arrester porcelain.
- 14.8.9** Seals shall be provided in such a way that these are always effectively maintained even when discharging rated lightning current.
- 14.8.10** The heat treatment cycle details along with necessary quality checks used for individual blocks along with insulation layer, formed across each block are to be furnished. Metalised coating thickness for reduced resistance between adjacent discs is to be furnished along with the procedure for checking the same. Details of thermal stability test for current distribution of current on individual disc is to be furnished.
- 14.8.11** Each individual unit of Surge Arresters shall be hermetically sealed and fully protected against ingress of moisture. The hermetic seal shall be effective for the entire lifetime of the arrester and under the service conditions as specified. The supplier shall furnish sectional view of the arrester showing details of sealing employed.
- 14.8.12** The Surge Arresters shall be suitable for hot line washing.

14.9 PORCELAIN HOUSING :

- 14.9.1** All porcelain Housings shall be free from lamination cavities or other flaws, affecting the maximum level of mechanical and electrical strengths.
- 14.9.2** The porcelain shall be well vitrified and non-porous.
- 14.9.3** The minimum creep age distance of the arrester housing shall be as per Cl 7.21 of the TS.
- 14.9.4** The porcelain petticoat shall be preferably of self-cleaning type (Aerofoil design). The details of the porcelain housing such as height, angle of inclination, shape of petticoats, gap between the petticoats, diameter (ID and OD) etc. shall be indicated by the Bidder in his offer in the form of detailed drawing.
- 14.9.5** Porcelain housings shall be so co-coordinated that external flash over will not occur due to application of impulse or switching Surge voltages up to the maximum design value for

arrester.

14.10 GALVANISATION, NICKEL PLATING ETC.:

14.10.1 All ferrous parts exposed to atmosphere shall be hot dip galvanized as per IS: 2629, as amended from time to time. Tinned copper/brass lugs shall be used for internal wiring of discharge counter. Screws used for electrical connections shall be either made of brass or shall be nickel-plated.

14.10.2 Ground terminal pads and nameplate brackets shall be hot dip galvanized.

14.10.3 The material shall be galvanized only after completing all shop operations

14.11 ACCESSORIES AND FITTINGS:

14.11.1 Surge Counters

14.11.2A self- contained Surge counter, suitably enclosed for outdoor use and requiring no auxiliary of battery supply for operation shall be provided for each unit. The surge counter shall be operated by the discharge current, passed by the surge arrester and shall be suitable for mounting on the support structure of the Arrester.

14.11.3 Surge counters shall be of the Electro-mechanical type and designed for continuous service.

14.11.4 The cyclometer counter shall be visible through an inspection window from ground level. The counter terminals shall be robust and adequate size and shall be so located that the incoming and outgoing connections are made with minimum possible bends.

14.11.5 Internal parts shall be unaffected by atmospheric conditions at site. Alternatively, a weather proof housing to IP 55 shall be provided and this shall be designed to allow the recording device to be read from ground level without exposing the internal parts to the atmosphere.

14.11.6 The Surge Counter shall be connected in the main earth lead from the arrester in such a manner that the direction of the earth lead is not changed or its surge impedance materially altered. A bolted link shall be provided so that the surge counter may be short circuited and removed without taking the arrester out of service.

14.11.7 All necessary accessories and earthing connection leads between the bottom of the Arrester and discharge counter shall be in the supplier's scope of supply.

14.12 LEAKAGE CURRENT METERS: (In case of 33 Kv surge arrester only)

14.12.1 Leakage current meters (suitable milli-ammeter) shall be connected in the earthing path of the surge arresters to measure the resistor grading leakage current. Meters shall be designed for continuous service.

14.12.2 The ammeter shall be suitable for mounting on the support structure of the arrester. The push buttons shall be mounted such that it can be operated from the ground level.

14.12.3 The internal parts shall be fully weather - proof to IP 55 or better with a transparent cover to provide an unobstructed view of the ammeter.

- 14.12.4** Arresters shall be complete with insulating base having provision for bolting to flat surface of the structure.
- 14.12.5** The grounding terminals shall be suitable for accommodating purchaser's grounding connection to steel earth mat.
- 14.12.6** The Bidder has to quote unit rates of the insulating base and the surge counter separately. The purchaser reserves its option to procure insulating base and surge counter.
- 14.12.7** Clamp type terminal connector, suitable for 33KV-AAA Panther-up Conductor shall be provided having both horizontal and vertical take-off.
- 14.12.8** Two clamp type ground terminal connectors, suitable for G. I. Strip (50 x 6) or (50 x 8) should be provided.
- 14.12.9** All interconnecting hardware such as nuts, bolts, spring washers etc. with 5% spares shall be supplied for different units
- 14.12.10 Pollution** Shunt (Copper braid) shall be supplied along with each surge Arrester for by-passing the surface current.

Other standard accessories, which are specifically not mentioned, but are usually provided with Surge Arrester of such type and rating for efficient and trouble free operation should be supplied.

14.13 NAME PLATE:

Each single pole Arrester shall be provided with non-corrosive legible name plate, at the base bearing thereon, voltage rating of the complete pole and the number of demountable sections with the following data, indelibly marked

- i) NESCO
- ii) Purchase order No. & Date.
- iii) Name of device.
- iv) Manufacturer's name and trademark and identification no. of the arrester being supplied.
- v) Year of manufacture
- vi) Rated voltage
- vii) Rated Frequency
- viii) Maximum continuous operating voltage.
- ix) Type
- x) Nominal discharge current.

- xi) Long duration discharge class.
- xii) Pressure relief current in KA(rms)
- xiii) Energy discharge capability (KJ / KV rating).

14.14 TEST :

14.14.1 Type Tests:

The surge Arrester offered should have been subjected to the following type tests in an independent Government approved test laboratory. The bidder shall furnish four sets of type test reports along with the offer. These tests must not have been conducted earlier than five years from the date of opening of technical bid. For any change in the design, type already type tested and the design type offered against this specification, the purchaser reserves the right to demand repetition of some or all type tests without any extra cost to NESCO in the presence of Purchaser's representative at the cost of the supplier.

- 1 **Insulation withstands tests:**
 - (a) Lightning Impulse Voltage Test.
- 2 Residual voltage tests.
- 3 Long duration current impulse withstands tests.
- 4 Operating duty tests.
- 5 Pressure relief tests.
 - (a) High current test.
 - (b) Low current test.
- 6 Power frequency voltage vs. time curve. (Temporary over voltage test)
- 7 Contamination test. (Artificial pollution test).
- 8 Seismic withstand test.
- 9 IP-55 test on surge counter.
- 10 Minimum current operation tests of the surge counter.
- 11 Maximum current withstand test of the surge counter.
- 12 Mechanical terminal load test on bushing.
- 13 Partial discharge test.

N.B. :-Even if the condition i.e. the dry arcing distance or the sum of the partial dry arcing distances is larger than the test voltage divided by 500 KV/m', the lightning impulse voltage test must have

been conducted or is to be conducted without any financial liability to NESCO.

Even if the type test reports are found to be valid as per this specification, the purchaser reserves the right to demand the repetition of some or all the type tests in the presence of purchaser's representative. For this purpose, the bidder shall quote unit rates for carrying out each type test. These prices, if necessary, will be taken into consideration for bid evaluation.

14.14.2 ROUTINE TESTS:

The following routine tests shall be conducted at the supplier's cost on each surge arrester and shall be submitted along with or before offering for inspection for purchaser's approval.

- (a) Measurement of reference voltage.
- (b) Residual voltage tests.
- (c) Measurement for partial discharge and contact noise.
- (d) Sealing test for units with sealed housings.

14.14.3 ACCEPTANCE TESTS:

The following tests, considered as acceptance tests, shall be conducted in the presence of purchaser's representative for which no charges will be payable by NESCO. The acceptance tests, whenever possible shall be conducted on the complete arrester unit. The number of samples to be subjected to acceptance test shall be decided by the purchaser at the time of actual testing.

- I Temperature Cycle Test on Housing.
- II Measurement of Power Frequency Voltage at the reference current.
- III Measurement of leakage current and capacitive current at M.C.O.V.
- IV Lightning Impulse Residual Voltage Test at N.D.C., 50% of N.D.C. & 200% of N.D.C.
- V Partial Discharge Tests on complete arresters/units at 1.05 times M.C.O.V.
- VI Special Thermal stability test.
- VII Porosity test on porcelain components.
- VIII Galvanization test on metal parts.
- IX The functional (operational) test on the Surge Counter by way of checking its operation at following nominal discharge currents:
 - a) 100 Amps with 8/20 micro second wave shape.
 - b) 10 KA with 8/20 micro second wave shape.
- X Check of calibration of leakage current meters.

14.15 INSPECTION:

- I The purchaser shall have access at all time to the works and all other places of manufacture, where the Surge Arresters are being manufactured and the supplier shall provide all facilities for unrestricted inspection of the supplier's works, raw materials, manufacture of all the accessories and for conducting the necessary tests.
- II The supplier shall keep the purchaser informed in advance of the time of starting and the progress of manufacture of equipment in its various stages so that arrangements could be made for inspection.
- III No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected tested and dispatch schedule attached to this specification.
- IV The acceptance of any quantity of equipment shall in no way relieve the supplier of his responsibility for meeting all the requirements of this specification and shall not prevent subsequent rejection, if such equipments are later found to be defective.

14.16 QUALITY ASSURANCE PLAN:

14.16.1 The Bidder shall invariably furnish following information along with his offer, failing which the offer shall be liable for rejection.

- (i) Statement giving list of important raw materials, 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 Bidder's representative, copies of test certificates.
- (ii) Information and copies of test certificates as in (i) above in respect of bought-out items.
- (iii) List of manufacturing facilities available.
- (iv) Level of automation, achieved and list of areas where manual processing exists.
- (v) List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of such tests and inspections.
- (vi) Special features provided in the equipment to make it maintenance free.
- (vii) List of testing equipments, meters available with Bidder for final testing of equipment, specified and test plant limitation, if any, vis-à-vis the type, acceptance and routine tests, specified in the relevant standards and this specification. These limitations shall be very clearly brought out in the offer.
- (viii) All the testing equipments, meters etc. should have been calibrated in a Government approved laboratory. The Bidder must submit the list of testing equipments and meters test-wise as per Annexure-C of this Technical Specification.

14.16.2 The suppliers, within 30 days of placement of order submit the following information to the purchaser.

- (i) List of raw materials as well as bought out accessories and the names of the materials as well as

bought-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 bought out accessories.
- (iii) Quality Assurance Plan (QAP) with hold points for the purchaser's inspection. The QAP and hold points shall be discussed between the purchaser and the supplier before the QAP is finalized.

14.16.3 The supplier shall submit the routine test certificates of bought out item and raw material at the time of acceptance testing of the fully assembled equipment.

14.17 DOCUMENTATION:

14.17.1 All drawings shall conform to relevant Indian Standard as per relevant IS. All drawings shall be in ink and suitable for microfilming. All dimensions and data shall be in S.I. Units.

14.17.2 The supplier shall furnish four sets of following drawings / documents along with his offer.

- (i) General out line drawings of the complete Arrester with technical parameters.
- (ii) Drawings showing clearance from grounded and other line objects and between adjacent poles of Surge Arresters, required at various heights of Surge Arresters.
- (iii) Drawings showing details of pressure relief devices.
- (iv) Detailed drawing of discharge counters along with the wiring and schematic drawing of discharge counter and meter.
- (v) Outline drawing of insulating base.
- (vi) Details of grading rings, if used.
- (vii) Mounting details of Surge Arresters.
- (viii) Details of line terminal and ground terminals.
- (ix) Volt-time characteristics of Surge Arresters.
- (x) Details of galvanization being provided on different ferrous parts.
- (xi) 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.
- (xii) Cross-sectional view of the Surge Arrester Units showing all components.

14.18 TEST REPORTS:

- (i) Four copies of type test reports shall be furnished to the purchaser with the tender specification.

Copies of acceptance test reports and routine test reports shall be furnished to the purchaser. One copy will be returned duly certified by the purchaser and only thereafter shall

the materials be dispatched.

(ii) All records of routine test reports shall be maintained by the supplier at his works for periodic inspection by the purchaser.

(iii) All test reports of tests, conducted during manufacture shall be maintained by the supplier.

These shall be produced for verification as and when requested for by the purchaser.

14.19 PACKING AND FORWARDING:

14.19.1 The equipment shall be packed in suitable crates so as to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement of lifting such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost.

14.19.2 Each consignment shall be accompanied by a detailed packing list containing the following information:

- (a) Name of the consignee :
- (b) Details of consignment :
- (c) Destination :
- (d) Total weight of consignment :
- (e) Sign showing upper/lower side of the crate :
- (f) Handling and unpacking instructions :
- (g) Bill of materials indicating contents of each package :

The supplier shall ensure that the bill of materials is approved by the purchaser before dispatch.

14.20 QUANTITY AND DELIVERY REQUIREMENT:

The scope of supply shall include a supply of 2.5% extra quantity of bolts, nuts, washers, split pins, cotter pins and such other small loose items free of cost.

**GUARANTEED TECHNICAL PARTICULARS OF 33KV L.A
(To be Submitted along with offer)**

Sl no.	Description	Specified	Bidder's offer
1	Nominal system voltage (phase to phase) (KV rms).	33	
2	Highest system voltage (phase to phase) (KV rms).	36	
3	System Frequency (HZ).	50 ±5%	
4	System Neutral earthing.	Effectively earthed	
5	Installation.	Outdoor	
6	Class.	Station class, 10 KA, heavy duty type	
7	Type of construction for 10 KA rated arrester.	Single column, single phase	
8	No. of phases.	Three	
9	Maximum duration of earth fault (Sec.)	3	
10	Maximum prospective symmetrical fault current at arrester location (KA rms.)	40	
11	Rated arrester voltage (KV rms)	30	
12	Nominal discharge current (KAP) Discharge current at which insulation co-ordination will be done	10 KA of 8/20 µsec Wave	
13	Minimum energy discharge capability (KJ/KV)	As per relevant ISS/IEC	
14	Maximum continuous operating voltage at 50° C (KV rms)	25	

15	Maximum switching surge residual voltage (KVP)	72 at 500A	
16	Maximum residual voltage at 8/20 micro second(KVP)		
	(i) 5 KA.	85	
	(ii) 10 KA Nominal discharge current.	90	
	(iii) 20 KA.	100	
17	Long duration discharge class	2	
18	High current short duration test value (KAP) (4/10 Micro-second wave).	100	
19	Current for pressure relief test (KA-rms)	40	
20	Minimum total creepage distance (mm).	900	
21	One minute dry and wet power frequency withstand voltage of Arrester housing (KV-rms).	70	
22 (a)	Impulse withstand voltage of arrester housing with 1.2/ 50 micro-second wave (KVP).	110.5	
b)	Switching Impulse Voltage (Wet) (KVP)	-	
23	Pressure relief class.	A	
24	Corona extinction voltage (KV-rms).	-	
25	RIV at 92 KV rms.	Less than 500 micro volts	
	Partial discharge at 1.05 times		

26	continuous over-voltage.	Nor more than 50 PC	
27	Seismic acceleration.	0.3g horizontal 0.15g vertical	
28	Reference ambient temperature.	50°C	
29	(a) IR at MCOV.	Less than 400 micro amperes	
	(b) IC at MCOV.	Less than 1200 micro amperes	
30	a) Reference Current (mA)	1 to 5 mA	
	b) Reference voltage at reference current.	Greater than rated voltage	
31	Maximum steep current Impulse RDV (KVP). at KAP	100	
32	Maximum cantilever strength of the arresters (KGM).	325	
33	TOV(KVP).		
	(i) 0.1 sec.	53	
	(ii) 1.0 sec.	51	
	(iii) 10.0 sec.	49	
	(iv) 100.0 sec.	47	

Name & Signature of Bidder with seal

ANNEXURE – B

CHECK – LIST

- 1 Whether calculation towards energy handling capability of the Surge Arrester furnished?
- 2 Whether the heat treatment cycle details along with necessary quality checks used for individual blocks furnished ?
- 3 Whether sectional view of arrester furnished showing details of sealing provided?
- 4 Whether porcelain petticoat is of Aero foil design? Whether drawing of porcelain Housing as per Clause No.7.9 of TS furnished?
- 5 Whether drawings and documents as per TS furnished?
- 6 Whether special measures in the manufacture of Surge Arrester for operating at ambient temperature of 50°C (against 40 °C as per IEC-99-4, Clause No.4.4.1) are to be taken?

..... State the special measures in details

Signature of the Tenderer With Seal & Date

