PRE-TENDER PURPOSE

TECHNICAL SPECIFICATION FOR POLYMER-HOUSED 12KV STATION-CLASS LIGHTNING ARRESTERS

1. Scope:

This Specification covers the **design, manufacturing, testing at manufacturer's works, packing, transportation to site, insurance, unloading & storage** of **Polymer-housed 12 KV Station-Class Lightning arresters /surge arresters,** complete with fittings and accessories.

The arresters shall be suitable for use on **11 KV Overhead Lines/system** located in any part of West Bengal under the jurisdiction of WBSEDCL. The lightning Arrestors are used for protection of incoming and outgoing line and also of the distribution/power transformers from lightning surge as well as from power frequency over voltage.

For the purpose of this specification, the terms ***Surge Arrester*** **and** ***Lightning Arrester*** **shall be considered equivalent**. Both refer to **metal-oxide surge arresters (ZnO type, gapless design)** intended for protection of equipment against over voltages caused by lightning, switching, or other transient surges. The device shall comply with **IEC 60099-4** and **IS 3070 (Part-3)** (latest amendments), and all references to "**Lightning Arrester**" in this specification shall be interpreted as "**Surge Arrester**" in line with current international and national standards.

2. General Requirements:

1. The lightning arresters/surge arresters shall be of **metal-oxide type (ZnO, gapless design),** conforming to **IEC 60099-4 and IS 3070 (Part-3)** with latest amendments. They are enclosed inside the **FRP (fibreglass-reinforced plastic) tube or core.**
2. The arrester shall be **polymer-housed**, of uniform **grey colour**, and **free from laminations, cavities, cracks, or surface irregularities** that may affect mechanical or electrical performance. Properties of the polymeric materials shall be specified in the offer and test reports for the same from a reputed Indian laboratory shall be submitted for approval. The rain sheds / petticoats shall be of silicon rubber and shall confirm to the properties and test reports is to be submitted. The petticoats shall not be pre-molded push on type.
3. Arresters shall be supplied complete with all fittings and accessories required for installation on 11 kV overhead lines/system.
4. The design shall ensure long-term reliability under outdoor service conditions, including resistance to tracking and erosion, UV radiation, pollution, and environmental stress.
5. The arrester shall be suitable for hotline washing, with smooth hydrophobic surface finish to facilitate cleaning.
6. Adequate creepage distance shall be provided, in line with IEC pollution class requirements for West Bengal service conditions. Sufficient creepage distance shall be provided to reduce excessive uneven voltages over the polymer housing due to contamination, for which the arrestor shall not fail.
7. The arrester shall be capable of withstanding mechanical loads and pressure relief tests as per IEC standards.The lightning Arrestors shall be of adequate Pressure Relief Class as per **IEC 60099-4**, fitted with Pressure Relief Devices and Arc diverting ports to minimise possibilities of shattering of Polymer housing.
8. Each unit shall be hermetically sealed with inert gas (Nitrogen) to prevent moisture ingress and ensure consistent performance. Seals shall be provided in such a way that these are always effectively maintained even whendischarging the maximum rated lightning current.
9. All metal end fittings shall be made of non-magnetic and corrosion proof material and mechanically robust.Arrestors shall be suitable for mounting on a support structure.
10. The arrester shall be designed for Long Duration Discharge Class 2 duty, suitable for WBSEDCL's distribution network. The arrestor elements shall be designed in such a way as to obtain robust construction with excellent mechanical and electrical properties even after repeated operation. The lightning arrestors should be adequately designed to operate satisfactorily under temporary power frequency over voltage as given in Specific Technical Parameters, after discharging two shots of respective long duration surges. Uniform density of zinc oxide element shall be maintained to provide uniform current distribution.

3. <u>Service condition</u>: The insulators to be supplied against this specification shall be suitable for satisfactory continuous operation under the following topical condition:

a) Max. ambient temperature : 50 º C
b) Min. ambient temperature : -5 º C
c) Relative humidity : 10 % to 100 %
d) Average number of rainy days : 100 / annum.
e) Max. Annual Rainfall : 1500 mm
f) Max. Wind Pressure : 150 Kg/ sq. Meter
g) Max. Wind Velocity : 50 Km/ hour
h) Max. Altitude above MSL : 1000 Meter
i) Seismic level : 0.3 g (Horizontal acceleration)
j) Average Thunder storm : 45 Days per annum
k) Climatic condition : Moderately hot and humid tropical climate, conductive to rust and fungus growth. Pollution level is high. Some area with seashores having saline atmosphere.

4. <u>System Parameters</u> :

a) Nominal system voltage : 11 KV.
b) Highest system voltage : 12 KV.
c) Power frequency : 50 Hz.
d) Number of Phases : Three.
e) System neutral earthing : 11 KV Solidly(effectively) earthed.

<u>DUTY REQUIREMENT</u>:
The Surge Arrestors are being provided to protect the following equipment whose insulation levels are indicated in the table given below:

Equipment to be protected	**L I for 12 KV system (in KVp)**
Power Transformer	±75
Instrument Transformer	±75
CB/Isolator Phase to ground	±75
Across open poles	-

The Lightning Arrestors shall be capable of discharging Lightning and switching surges and temporary power frequency over voltages. The Surge Arrestor shall be capable of discharging over voltages occurring during switching of unloaded transformers and long lines.

The Arrestors shall be capable of withstanding Maximum Continuous Operating Voltages (M.C.O.V).

5. <u>Standard</u>: The following Indian / International Standards with latest revisions and amendments shall be referred while accessing conformity of **Station-Class Lightning arresters /surge arresters** with this specification:

(i) IEC 60099-4 : Metal oxide surge arresters without gaps for AC systems.
(ii) IEC 60099 Part 3 : Artificial pollution testing of lightning arresters.
(iii) IEC 60270 : Partial Discharge (PD) measurements.
(iv) IS 2071& IEC 60060: Methods of HV Testing.
(v) IS 3070 (Part-3) : Lightning arresters for Alternating Current Systems.
PART-3 : METAL OXIDE LIGHTNING ARRESTERS WITHOUT GAPS.
(vi) IS 15086 : Surge Arrestors.
(vii) IS 5621 : Hollow Insulators for Use in Electrical Equipment.

6. DEVIATION:

Normally the offer should be as per Technical Specification without any deviation. But any deviation felt necessary to improve performance, efficiency and utility of equipment must be mentioned in the 'Deviation Schedule' with reasons duly supported by documentary evidences and advantages of such deviation. Such deviations suggested may or may not be accepted. But deviations not mentioned in Deviation Schedule will not be considered.

7. FITTINGS & ACCESSORIES:

Arrestor shall be directly mounted on structure as there is no surge counter.

Each single pole arrestor shall be provided with suitable name plate, at the base with the following data:

i) Name of device
ii) Manufacturer's name and trade mark, type and identification
iii) Year of manufacture
iv) Voltage rating & frequency rating.
v) Nominal discharge current
vi) MCOV (Maximum Continuous Operating Voltage in KV).
vii) Discharge class.
viii) Energy Discharge capability (KJ/KV rating)
ix) Purchase Order reference.
x) Applicable Standard.
xi) Pressure Relief rated current in KA rms
xii) Serial Number
xiii) Property Plate ("Property of WBSEDCL")

Clamp type terminal connector shall be suitable for DOG / RABBIT Conductor for 12 KV system voltage class L.A. having horizontal/vertical take off. Detailed particulars have been indicated in the specification for Clamps and Connector in this bid document.

Two ground terminal connectors suitable for G.I strip of required size shall be provided on diagonally opposite sides.

Necessary hardware such as nuts, bolts, spring washers etc. shall be shall be as per relevant IS and shall be hot dip galvanized and supplied as per required quantities for different units.

8. TENDER DRAWINGS, CATALOGUES*:*

General outline drawing giving plan, elevation, side view and sectional view, top and bottom connection arrangement with pitch circle diameter and other dimensions of the complete assembly with surge counter and leakage current measuring meter where applicable, Size of terminals and lifting lugs, shipping weight etc are to be indicated.

9. CONTRACT DRAWINGS AND MANUALS:

In the event of placement of Order, six (6) copies of drawings and descriptive literatures shall be furnished to the Chief Engineer, P&CD, Vidyut Bhavan (4th Floor), Salt Lake, Kolkata - 700 091 for approval :

(i) General Outline Drawing showing plan, elevation and end views with dimensions and showing full mounting details with weights.

(ii) Dimensional Drawing showing the Arrester mounted on its base and where applicablewith surge counter and leakage current measuring meter.

(iii) Details of Bushing top terminals & terminal connectors.

(iv) Shipping Dimensional Drawings with weights.

(v) Position of Centre of gravity and clearances with adjacent grounded metallic structures.

(vi) Diagram plate showing electrical connections of the surge counter and leakage current measuring meter where applicable.

(vii) Rating Plate.

(viii) Complete foundation drawings for the structure of Lightning arrestor, where applicable.

(ix) Property Plate.

Ten (10) sets of approved drawings and operation and maintenance manuals shall besubmitted for our record and distribution to site.

10. TESTS:

(A)TYPE TESTS:

The tenderer shall furnish following Type Test reports of the offered Surge Arrester for all the Type Tests as per **IEC 60099-4 & IS 3070 (Part-3)** amended upto date and this specification along with the offer.

All these Type Tests shall be carried out at laboratories which are accredited by the National Accreditation Board of Testing and Calibration Laboratories (NABL) of Government of India to prove that Surge Arresters offered meet the requirements of the specification. These Type Tests should have been carried out within five years (05) or as per the latest CEA guidelines, prior to the date of opening of the tender.

The detailed Type Test reports along with the relevant oscillograms/certified drawings etc. are to be submitted along with the offer.

The following Type Tests shall be made as per IEC 60099-4 & IS 3070 (Part-3) amended up to date and need to submit with the technical bid:

i) **Insulation Withstand Test on arrestor housing:**

a) Lightning impulse test
b) Power Frequency test

ii) **Residual Voltage Test** :

a) Steep Current
b) Lightning impulse
c) Switching impulse

iii) **Test to Verify long term stability under continuous operating voltage**

iv) **Repetitive charge transfer withstand**

v) **Heat dissipation behaviour verification on test sample**

vi) **Operating Duty test**:

a) High current impulse operating duty test
b) Switching surge operating duty test

vii) **Power frequency voltage vs time**

viii) **Dynamic Short circuit test and Short circuit test**

ix) **Bending Moment test**

x) **Environmental test**

xi) **Seal leak rate test**

xii) **Test to verify the dielectric withstand of the internal components of arrester**

xiii) **Test of internal grading components**

xiv) **Polluted Housing test**

xv) **Galvanising test on metal parts**

xvi) **Temperature cycle test on polymer LA**

xvii) **Reference voltage test**

xix) **Internal Partial discharge test**

TYPE TESTS after issuance of order :

Besides submission of Type Test Report, carried out within five years or as per the latest CEA guidelines as per Tender Specification, Type Test at the discretion of Ordering authority, shall have to be arranged by the successful contractor from any lot offered for inspection, sample chosen at random after successful Routine Test by our Inspection Team, as per relevant ISS from NABL accredited/Govt. Recognized Test House or Laboratory in presence of WBSEDCL'S representative. In case of failure of the materials after type test the WBSEDCL will have the right to reject the total supplied lot of the said materials and the party has to replace the complete lot of materials at his own cost including transportation of materials at site.

However the necessary cost of the successful Type Test charges will be reimbursed to the party on production of necessary supporting documents.

(B) <u>TEST AT FACTORY AND TEST CERTIFICATES</u>:

Each LA shall comply with the requirements of routine test as specified in the relevant IEC 60099-4 & IS 3070 (Part-3).

Acceptance test at manufacturer's works shall be carried out in presence of representative of WBSEDCL.

All routine & acceptance tests shall be carried out at the manufacturer's works on every lot offered for inspection as per relevant IEC & IS. Selection of samples for acceptance test as well as rejection and retesting shall be guided by relevant IEC & IS. Six (6) copies of Test Reports shall be submitted to the Chief Engineer (P&CD), Vidyut Bhavan (4th Floor), Salt Lake, Kolkata - 700 091 for approval. Adequate extra copies should also be submitted to Chief Engineer (P&CD) Vidyut Bhavan (4th Floor), Salt Lake, Kolkata - 700 091 for distribution to site.

The manufacturer shall give at least 15 (fifteen) days' advance notice intimating the actual date of inspection and details of all tests that are to be carried out. Relevant Type & Routine Tests' Certificates obtained from the competent Authorities for all accessories/ bought out items shall have to be furnished.

- **<u>Routine Test</u>:**
  1) **Measurement of Power Frequency Reference Voltage;**
  2) **Measurement of Partial Discharge;**
  3) **Leakage Current Test;**
  4) **Measurement of Residual Voltage at Nominal Discharge Current;**
  5) **Seal Leak Test;**
  6) **Galvanization test on exposed metal parts;**
  7) **Visual examination and dimensional verification as per approved GTP and Drawing.**
- **<u>Acceptance Test</u>:**
  1) **Measurement of Power Frequency Reference Voltage;**
  2) **Measurement of Partial Discharge;**
  3) **Leakage Current Test;**
  4) **Measurement of Residual Voltage at Nominal Discharge Current;**
  5) **Seal Leak Test.**
     Reference voltage test, partial discharge test should be carried out and insulation resistance is to be measured before and after seal leak test ;
  6) **Galvanization test on exposed metal parts;**
  7) **Visual examination and dimensional verification as per approved GTP and Drawing;**
  8) **Destructive test for ZnO Block measurement;**
  9) **Lightning impulse residual voltage test.**

11. **<u>Documents to be submitted at the time of physical delivery at consignee stores</u> :**
The following documents are to be submitted by the vendors to the consignee Stores at the timeof despatch to stores by the vendors:-

a) Copy of Purchase Order.
b) Copy of Despatch Instruction.
c) Inspection Test Certificate.
d) Guarantee Certificate.
e) Proforma Invoice.
f) Calculation Sheet for price Variation on the basis of IEEMA or CACMAI as applicable with base date of order.
g) Seal list and packing list.
h) Challan in triplicate.
i) Way bill, if applicable.

12. **<u>Guarantee</u> :** In the event of any defect in the equipments/materials arising out due to faulty design, constituent elements, workmanship within period of **5 (five) years** from the date of last despatch of any integral part of the equipments/materials , the supplier shall guarantee to replace or repair the same free of cost to the satisfaction of the purchaser.

If the supplier fails to replace/repair the same within two months from the date of receipt of intimation, WBSEDCL reserves the right to effect replacement and recover the cost of replacement at 1.25 times of last purchase price of that equipment from the defaulting vendor by invoking Security Deposit/ Earnest Money Deposit to the extent of loss so suffered by WBSEDCL and may deduct the additional amount, if any, so incurred by WBSEDCL from any claims/bills of that vendor pending with WBSEDCL or from any other contract with that vendor. **Lifting of the defective equipments/materials shall be made from any WBSEDCL Store and return after rectification shall be made at the same WBSEDCL store**.

SPECIFIC TECHNICAL PARAMETERS- I

	TYPE OF POLYMER ARRESTER	***STATION CLASS HEAVY DUTY GAPLESS***
i)	Nominal system voltage (KVrms)	11
ii)	Highest system voltage (KVrms)	12
iii)	System Neutral Earthing	Effectively Earthed
iv)	BIL of transformers (KVp)	75
v)	System fault level (KA)	18.4
vi)	Maxm. System BIL (KVp)	75
	POLYMER LA RATINGS :	
i)	Rated Voltage (KVrms)	12
ii)	Maxm. Continuous operating voltage (KVrms)	10
iii)	Nominal Discharge Current (KAp)	10
iv)	Line discharge class	2
v)	Minimum Energy Discharge capability(KJ/KV) [If there is any Deviation the same may be mentioned in the Deviation Sheet]	> 4
vi)	Temporary over voltage withstand capability (KVrms) for 10.0 secs	12
vii)	Insulation Housing withstand voltages i) Lightning Impulse(Dry)	Minimum values as per IEC
	ii) Power frequency(wet) for 10 KA	Minimum values as per IEC
viii)	Minimum creepage Distance acceptable (mm)	300
	i) Pressure Relief Class	A (To be tested in accordance with IEC)
ix)	(Minimum) High Current Impulse withstand (4/10) KA (peak)	100
x)	Maxm. Lightning Impulse (8/20 micro-second impulse) residual voltage (KVp) :	
	5 KA	
	10KA	40
xi)	Maxm. switching surge (30/60 micro-second wave) protective level (KVp)	
	500 Amps	21
	1000 Amps	-
	2000 Amps	-
xii)	Maxm. Steep Impulse (1/20 micro-seconds impulse) residual voltage at 10 KA (KVp)	45
xiii)	RIV/Partial Discharge (micro-volt / pico- coulomb) when energised at 1.05 times itscontinuous operating voltage shall not exceed	1000 microvolt/ less than 500 pico-coulomb
xiv)	Terminal connection	Suitable for Dog/Rabbit ACSRConductor
xv)	Rated Frequency (Hz)	50
xvi)	Visible Corona Discharge voltage (KV rms)	**9 KV rms for 5 minutes**
xvii)	Packing	**Strong Corrugated Box of minimum 7 ply duly pallet OR better than that**

GUARANTEED TECHNICAL PARAMETERS

	TYPE OF POLYMER ARRESTER	***STATION CLASS HEAVY DUTY GAPLESS(12KV)***
Sl. No.	**Name of the Manufacturer**	
	Description of the item	
i)	Nominal system voltage (KVrms)	
ii)	Highest system voltage (KVrms)	
iii)	Rated Frequency(Hz)	
iv)	System Neutral Earthing	
v)	BIL of transformers (KVp)	
vi)	System fault level (KA)	
vii)	Maxm. System BIL (KVp)	
	POLYMER LA RATINGS :	
i)	Rated Voltage (KVrms)	
ii)	Reference current at ambient temperature	
iii)	Reference voltage at mentioned reference current ambient temperature	
iv)	Maximum Continuous operating voltage (KVrms)	
v)	Nominal Discharge Current (KAp)	
vi)	Line discharge class	
vii)	Minimum Energy Discharge capability (KJ/KV)	
viii)	Repetitive charge transfer rating(Qrs)	
ix)	Temporary over voltage withstand capability(KVrms) for 10.0 secs	
x)	Insulation Housing withstand voltages i) Lightning Impulse (Dry) ii) Power frequency (wet)	
xi)	Minimum creepage Distance acceptable (mm)	
xii)	Pressure Relief Class	
xiii)	(Minimum) High Current Impulse withstand (4/10) KA (peak)	
xiv)	Maxm. Lightning Impulse (8/20 micro-Second impulse) residual voltage (KVp) :	
	5 KA	
	10KA	
xv)	Maxm. switching surge (30/60 micro-secondwave) protective level (KVp)	
	500 Amps	
	1000 Amps	
	2000 Amps	
xvi)	Maxm. Steep Impulse (1/20 micro-seconds impulse) residual voltage at 10 KA (KVp)	
xvii)	RIV/Partial Discharge (micro-volt / pico- coulomb) when energised at 1.05 times its continuous operating voltage shall not exceed	
xviii)	Material of upper end assembly along with Top cover	
xix)	Material of lower end assembly	
xx)	ZnO Block	
	a) Rated Voltage	
	b) MCOV	
	c) Dimension of each block	
	d) No. of block to be used	
xxi)	Weight	
xxii)	Height	
xxiii)	Terminal Connector and Hardware	
xxiv)	Packing and Guarantee	

Date:
Place:

Name & Signature:
Name and seal of the Company: