POLYMER HOUSED SURGE ARRESTORS

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Engineering Department

WEST BENGAL STATE ELECTRICITY TRANSMISSION COMPANY LIMITED

পশ্চিমবঙ্গ রাজ্য বিদ্যুৎ সংবহন কোম্পানি লিমিটেড

(পশ্চিমবঙ্গ সরকারের একটি উদ্যোগ)

Regd. Office: Vidyut Bhawan, Block – DJ, Sector-II, Bidhannagar, Kolkata – 700091. CIN: U40101WB2007SGC113474; Website: www.wbsetcl.in

Updates for WBSETCL / TECH SPEC / Rev.-3.1

1. The rated voltage, TOV withstand capability for 10 sec and MCOV are updated for 12KV LA.

Updates for WBSETCL / TECH SPEC / Rev.-3.2

1. SPECIFIC TECHNICAL PARAMETERS

   The Minimum creepage Distance value is fixed at 31 mm/KV for all voltage classes.

TECHNICAL SPECIFICATION FOR POLYMER HOUSED SURGE ARRESTORS

1. SCOPE

This Specification covers design, manufacture, testing at manufacturer's Works of Gapless, Heavy Duty, METAL-OXIDE Surge Arrestors complete with discharge counter, insulating base fittings and accessories at any suitable location of.
Arrestors shall be suitable for outdoor installation on self-supporting base or structures.

Specific Technical Particulars and GTP of those LA's shall be guided by relevant IS & IEC and Scheme requirement.

2. BID RESPONSIVENESS

The surge Arrester to offer must be type tested as per relevant clause of IEC 60099-4 in any International or NABL accredited National test laboratory. The copy of the Type Test Certificate shall have to be attached for consideration of the bid to be responsive. Tendering Authority may ask the Bidder to present the original copy of the Type Test Report for verification of the submitted test copy.

3. STANDARD

Arrestors shall conform in general to IEC-60099-4 document or its latest amendment and IS/IEC as follows:

IEC-60099-4	Gapless Lightning Arrestor
IS 3070 P-III	Metal Oxide Surge Arrestors without gaps for AC Systems
IEC 99 P-III	Artificial Pollution Testing of Lightning Arrester
IEC 270	Partial Discharge Measurement
IS 2071	Methods of H V Testing

IS 6209	Methods for Partial Discharge Measurement Methods for Partial Discharge Measurement
IS 5621	Hollow Insulators for use in electrical equipment.

4. I) DEVIATION

Normally the offer should be as per Technical Specification without any deviation.

II) <u>MODIFICATION :</u>

If any modification felt necessary to improve performance, efficiency and utility of equipment, the same must be mentioned in the 'Modification schedule' with reasons duly supported by documentary evidences and advantages. Such modifications suggested may or may not be accepted, but the same must be submitted along with Prebid Queries. The modifications not mentioned in Schedule will not be considered.

5. DUTY REQUIREMENT

The Surge Arrestors are being provided to protect the following equipment whose insulation levels are indicated in the table given below to:

a) The Lightning Arrestors shall be capable of discharging Lightning and switching surges and temporary power frequency over voltages. The energy handling capacity of arrester offered should be supported by calculation.

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

c) The Arrestors supplied shall be suitable for heavily polluted atmosphere.

d) The reference current of the Arrestors shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltages.

e) The Surge Arrestor shall be suitable for duty cycle of circuit breaker in the system.

f) The Over voltage of the system are tabulated as follows:

Equipment to be protected	Switching surge (KVp) for 420KV System	L1 for 420KV System (KVp)	L I for 245 KV system (KVp)	L I for 145 KV system (KVp)	L I for 36 KV system (KVp)
Power Transformer	± 1050	± 1300	± 950	±550	±170
Instrument Transformer	± 1050	± 1425	± 1050	±650	±170

Circuit Breaker	± 1050	± 1425	± 1050	±650	±170
Isolator Phase to ground	± 1050	± 1425	± 1050	±650	±170
Isolator Across open poles	± 900 (-/+ 345)	± 1425 (-/+ 240)	±1200	±750	±195
Reactor	± 1050	± 1300	-	-	-
XLPE cable	± 1050	± 1425	± 1050	±650	±170

6. CONSTRUCTION

6.1 The arrestor elements shall be designed in such a way as to obtain robust construction with excellent mechanical and electrical properties even after repeated lightning phenomenon.

(a) The surge arrester shall be constructed to withstand the continuous & abnormal stresses like: Continuous operating voltage, Rain, Pollution & Sun Radiation, Operation Temperature, Wind Loading.

(b) The surge arrester shall also be capable to withstand additional, non-frequent abnormal stresses like - Temporary over Voltage (TOV). OV due to transients which affects thermal stability & ageing, Energy & Current Withstand Capacity and External Insulation withstand.

(c) The surge arrester shall be constructed to withstand large mechanical forces for earthquake and severe external pollution.

6.2 **Zinc Oxide Varistors:** The Zn Ovaristers shall be densely sintered block pressed to a cylindrical body. The block shall consist of 90% zinc-oxide and 10 % of other metal oxides as additives with bismuth oxide. The manufacturing process shall be done in proper way to give the varisters its non-linear characteristics. Conducting material (Aluminum) shall be applied at the end of the finished varistors to improve the current carrying capability and to secure a good contact between series-connected varistors. Insulating Layer should be applied to the cylindrical surface for protection against external flash-over & chemical influence.

6.3 The surge arrester construction design shall be cage design formed of fibre glass reinforced loops with protective fibre winding wound over the loop to give the arrester modules high mechanical strength & better short circuit performance. The construction design for 400 KV Surge Arrester shall be of Tubular Design with an annular gas-gap between the active parts and the external insulator and equipped with pressure relief device. The surge arrester shall not have any air volume enclosed within.

6.4 **The housing** of the Surge Arrester shall be of silicon rubber. Silicon Rubber Housing shall be free from lamination cavities or other flaws affecting the mechanical and electrical strengths. 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 submitted. The petticoats shall not be pre-molded push on type.

6.5 The external insulating part of the Surge Arrester shall provide **Creepage** 31 mm/KV considering the pollution level –IV as per IEC 60099-4.

6.6 Surge Arrester shall be sealed single phase, single module unit up to 66 KV, single phase maximum two (2) module unit for 145 KV, single phase maximum four (4) module unit for 245 KV & 420 KV. Series Parallel Combinations of modules may be accepted for 245 KV & 420 KV Surge Arrester after detailed engineering with the manufacturer after placement of LOA. Series modules shall have to be used in Transmission Line Surge Arrester when fitted on the transmission tower.

6.7 Surge arresters for system voltages approximately 245kV and above must normally be equipped with one or more metallic rings hanging down from the top of the arrester to ensure that the electrical field surrounding the arrester is as linear as possible and also to prevent external corona from the upper metallic flange and from the line terminal for 400 KV Surge Arrester.

6.8 The line terminal connector shall be nonmagnetic and of corrosion proof Aluminum material through machining process/die casting process. The earthing terminal shall be of stainless-steel material.

6.9 **Surge Counter:**

a) Surge Arrestors shall be complete with insulating base for connection to surge counter having provision for bolting to flat surface of structure.

b) Self-contained discharge counters suitably enclosed for outdoor use shall be provided for each single pole unit and placed on the Arrestor Structure, but requiring no auxiliary or battery supply for operation.

c) The following specification of the Surge Counter is tagged for convenience

Meter	6 Digit cyclometer with at least one count /second.
Minimum count Current	100 A for 8 /20 micro-sec wave.
Maximum High Current withstand	100 KA for 4/10 micro-sec wave
Nominal Residual Voltage at 100kA with	5 KV Peak
Meter Scale	0-5 mA Peak/√2 (bilinear scale)
Safe leakage current	0-2 mA Peak/√2 (bilinear scale)

7 RATING PLATE INFORMATIONS

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

Name of the Device		Frequency	
Name of the Manufacturer		MCOV	
Year of manufacture		Discharge Class	
Type of Surge Arrester		Nominal Discharge Current	
Application Standard		Energy Discharge Capacity (KJ/KV)	
Serial No		PO Reference	
Voltage Rating			

8 GUARANTEED TECHNICAL PARTICULARS

Electrical characteristics shall be guaranteed by the bidder. In case of failure of materials to meet the guarantee, WBSETCL shall have right to reject the material. Guaranteed Technical Particulars are to be submitted by successful bidder during detailed engineering along with submitted drawings/documents. However, format for submission of GTP shall be handed over to intending bidders at the time of sale of tender documents.

9 CONTRACT DRAWINGS AND MANUALS

9.1 In the event of placement of L.O.A., six (6) copies of drawings and descriptive literatures shall be furnished for approval:

a. *Rating Plate.*
b. *General Outline Drawing showing plan, elevation and end views with dimensions and showing full mounting details with weights.*
c. *Dimensional Drawing showing the Arrestor mounted on its base and where applicable with surge counter and leakage current measuring meter.*
d. *Details of Bushing top terminals.*
e. *Shipping Dimensional Drawings with weights.*

f. *Position of Centre of gravity and clearances with adjacent grounded metallic structures.*

g. *Diagram Plate showing electrical connections of the surge counter and leakage current measuring meter where applicable.*

h. *Complete foundation drawings for the structure of Lightning arrestor, where applicable.*

9.2 Four (4) sets of approved drawings and operation and maintenance manuals both in hard and soft copy shall be submitted for our record and distribution to site.

10 TYPE TEST REPORT TO BE SUBMITTED

The following Type test Report / in line with IS/IEC shall have to be submitted by the bidder. Validity of type test will be as per recent CEA guide line

a. Residual Voltage measurement at different current amplitudes and waveshapes.
b. Current Impulse withstands tests.
c. Operating duty test
d. Accelerated ageing test
e. Artificial pollution test
f. External insulation test
g. Short Circuit Test.
h. Mechanical Test

11 TEST AT FACTORY AND TEST CERTIFICATES

1. Each Surge Arrester shall comply with the requirements of routine test as specified in the relevant IEC: 60099-4 & IS: 3070 (Part - III).

2. Inspection Call for Routine test at manufacturer's works shall be given by the party after carrying out Routine Test for the Surge Arresters by the manufacturer and Test reports shall have to be submitted. The test values if found well within permissive range, inspection will be carried out by the Engineers of the Ordering Authority for witness testing of the Surge Arrester.

3. Acceptance tests shall be carried out at the manufacturer's works on every lot offered for inspection as per relevant IEC & IS in presence of representative of WBSETCL. Selection of samples for acceptance test as well as rejection and retesting shall be guided by relevant IEC & IS. The entire cost of acceptance and routine tests that are to be carried out as per relevant IEC & IS shall be treated as included in quoted price of Surge Arrester. Six (6) copies of test reports shall be for approval and adequate extra copies for distribution to site.

4. The bidder/ manufacturer shall give advance notice intimating the actual date of inspection and details of all tests that are to be carried out.

SPECIFIC TECHNICAL PARAMETER

SL. NO.	DESCRIPTION	TECHNICAL PARAMETER						
	TYPE OF ARRESTOR	STATION CLASS HEAVY DUTY GAPLESS						
	Nominal system voltage (KV)	400	220	132	66	33	33	11
	Highest system voltage (KV)	420	245	145	72.5	36	36	12
	System Neutral Earthing	EE	EE	EE	EE	Earth without Earthing Transformer	Earth with Earthing Transformer	EE
	BIL of transformers (KVp)	1300	900	550	350	250	170	75
	System fault level (KA) Sec	50 for 1 sec	40 for 3 sec	31.5 for 3 sec	31.5 for 3 sec	31.5 for 3 sec	31.5 for 3 sec	16 for 3 sec

	Lightning Impulse withstand voltage for arrestor housing KVp)	1425	1050	650	325	250	170	75
	Rated Voltage (KV)	360 or as specified	198	120	60	54	42	**12 (R3.1)**
	Maxm. Continuous operating voltage (KVrms)	306	168	102	50	43	36	**10.2 (R3.1)**
	Nominal Discharge Current (KAp) of 8/20 micro second wave	10/20	10	10	10	10	10	10
	Line discharge class	3	3	3	2	2	2	2
	Minimum Energy Discharge capability (KJ/KV) at rated voltage.	10	7.5	7.5	5	5	5	5
	Temporary over voltage withstand capability (KV rms) for 10sec	360 or as specified	198	120	63	54	42	**12 (R3.1)**
	Insulation Housing withstand voltages i) Lightning Impulse (Dry) ii) Power frequency(wet) for 10 KA	As per IEC 60099-4						
	Minimum creepage Distance (mm) (31 mm/KV) [R3.2]	~~10500~~ 13020	~~6125~~ 7595	~~3625~~ 4495	~~1820~~ 2250	~~1350~~ 1675	~~900~~ 1116	~~300~~ 372
	Pressure Relief Class	A						