

# **SECTION -IV**

## **TECHNICAL SPECIFICATION OF LINE & SUB-STATION MATERIALS**

**Tender Notice No. NESCO Utility / L&S Materials /16 / 11402, dtd.03.10.16**

**Require Materials :**

Sl. No.	Description of materials	Unit	Quantity
1	3 Pole 11KV 200Amp ABSwitch	Set	212
2	11KV V Cross Arm (GI)	No	254
3	Back Clamp for 11 KV 'V' (GI)	No	254
4	11 KV 'F' Clamp (GI)	No	254
5	Back Clamp for 11 KV 'V' (MS)	No	109
6	MS Back Clamp for Stay Set (HT)	pair	94
7	MS Back Clamp for Stay Set(LT)	pair	171
8	Dead End Clamp	No	342
9	Suspension Clamp	No	511
10	Pole Clamp with Eye Hook	No	853
11	16mmx150mm GI Nut & Bolt	Kg	55
12	16mm GI stay set	set	171
13	7/10 GI Stay Wire	Kg	940
14	7/12 GI Stay Wire	Kg	1705
15	Earthing Coil	No	304
16	Danger Board	No	212
17	11 KV Pin Insulator	No	398
18	11 KV 70KN B&S Disc Insulator	No	281
19	11 KV Stay Insulator	No	94
20	LT Stay Insulator	No	171
21	11KV Lightning Arrestor (12KV,10KA distribution class)	No.	636

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. Bidders should submit samples of their quoted items at NESCO Utility Store, Balasore and furnished store receipt copy along with bid documents for verification .

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 .

**General Manager (C&P)**  
NESCOUtility, Balasore, Odisha

# TECHNICAL SPECIFICATION

## 11 KV 200 Amp 3 Pole AB Switch

### 01.0 **Scope: -**

This specification covers manufacturing testing and supply of 11KV 200 Amps 50HZ Air Break switches for out door installation in horizontal configuration. The switches are suitable for operation under off load conditions only and are intended for use on Distribution Sub-stations and tapping sectionalizing points of 11 KV lines.

### 02.0 **Description of the materials: -**

The 11KV A.B. Switch sets shall confirm to the following parameters: -

a. Number of poles	3
b. Number of Post insulator per pole	2nos12KVpostinsulator.
c. Nominal system voltage	11KV
d. Highest system voltage	12KV
e. Rated frequency	50Hz
f. System earthing	effectively earthed.
g. Rated nominal current	200 amps
h. Altitude of installation	Not exceeding1000M

The post insulators used in the A.B. Switches shall have the following ratings :-

a. Power frequency withstand voltage (dry)	35KV (RMS)
b. Power frequency withstand voltage(wet)	35KV (RMS)
c. Implies withstand voltage(dry)	75KV
d. Power frequency puncture withstand	1.3 times of dry flash over voltage

### 03.0 **Standards: -**

The AB Switch Set shall conform to the following standards: -

- IS-9920 (Part-I to V)
- IS-2544/1973 (for porcelain post insulators)
- IS-2633, (for galvanization of ferrous parts.) or its latest amendments if any.

### 04.0 **Insulator make: -**

12KV post insulators complete with post and cap duly cemented to be used in the AB Switch Set conforming to IS-2544/1973.

The bidder shall furnish the type test certificate of the post insulators from their manufacturer for reference and scrutiny.

The bidder shall mention make, type of insulation materials, metal fittings, Creepage distance,

protected Creepage distance, tensile Strength, compressing strength, torsion strength and cantilever strength.

#### 05.0 Climatic condition: -

The A.B. Switch set shall be suitable for operation under the following climatic conditions.

a. Maximum ambient air temperature	45 ° C
b. Maximum daily average air temperature	35 ° C
c. Maximum yearly average ambient air temperature	30 ° C
d. Maximum temperature attainably by a body	
e. Exposed to the Sun.	50 ° C
f. Minimum ambient air temperature	0 ° C
g. Maximum relative humidity	100%
h. Minimum number of rainy days per annum	70
i. Average number of rainy days per annum	120
j. Average annual rain fall	150cm.
k. Number of months of tropical monsoon conditions	4
l. Maximum wind pressure	260Kg./mm <sup>2</sup>
m. Degree of exposure to atmospheric pollution	normally
n. Atmosphere.	Polluted.

#### 06.0 Other technical details: -

06.01 **General:** - The 11KV A.B. Switch Set shall be the gang operated rotating single air break type having 2 post insulators per phase. The operating mechanism shall be suitable for manual operation from the ground level and shall be so designed that all the three phases shall open or close simultaneously. The Switches shall be robust in construction, easy in operation and shall be protected against over travel or staining that might adversely affect any of its parts. The required base M.S. Channel (hot dip galvanized) phase coupling rod, operation rod with intermediate guide braided with flexible electrolytic copper, tail piece of required current carrying capacity and operation mechanism with 'ON' & 'OFF' positions shall be provided. The operation rod shall be medium gauge of 32mm diameter nominal bore G.I. pipe single length 6 meters. The phase coupling rod for gang operation shall be of medium gauge 25mm dia & 2100 mm length nominal bore G.I. pipe. The Rating post insulators shall be provide with suitable bearing mounted on a base channel with 8mm dia thrust collar and 6mm split pin made out of stainless steel. The operating down rod shall be coupled to the spindle (minimum dia – 32mm) for gang operation through another suitable bearing by two numbers 10mm dia stainless steel bolts with double nuts. All the bearings shall be provided with grease nipple. All metal (ferrous) parts shall be galvanized an polished. The pipe shall be galvanized in accordance with IS-4736/1968. The post insulators should be fixed with the base channel using Galvanized Nuts and Bolts.

06.02. **Mounting:-** The A.B. Switches shall be suitable for horizontal mounting in double pole sub-station structures. MS Galvanized base Channel & base support channel should be of min. size 75x40x6 mm.

06.03. **Switching Blades:** - It shall be made out of electricity copper with silver plated.

The approximate size shall be 220mm X 35X 6mm. The Switch shall have such a spring mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation.

06.04 **Fixed Contacts:** - The Fixed Jaw type female contacts of size (70x35x6) mm shall be made of electrolytic copper (minimum 95% copper composition) duly silver coated controlled by phosphorous bronze high pressure spring housed in robust G.I. Cover. It is essential that provision shall be made in fixed female contracts to take the shock arising from the closing of move contract blade without the same being transmitted to the post insulator. The arrangement made in this regard shall be specifically shown in the drawing.

06.05 **Arcing Horn:** - As the switches are generally meant for isolating transmission line and distribution transformers, suitable arcing horns shall be provided for breaking the charging current horn shall be made of 8 mm dia G.I. Rod with spring assisted operation.

06.06 **Terminal Connectors:** - Terminal connectors shall be robust in design. The size of fixed connector shall be (65 X 35 X 6 mm) and size of movable connector shall be of (65 X 35) X (65 X 35) X 6mm of copper casting with uniform machine finishing duly silver plated made out of minimum 95% copper composition with 2 nos. 12mm dia holes provided with suitable brass bolts and double nuts, flat washers & 2nos. bimetallic solder less sockets suitable up to 80 mm<sup>2</sup> conductor.

06.07 **Spacing:** - The minimum clearance between phases to the switch shall be 760mm. The operation down rod shall be at a transverse distance of 300mm from the outer limb of the switch. The centre spacing between two post insulators of the same phase shall be 380 mm. In the open position of the A.B. switches the moving blade shall rotate through 90<sup>o</sup>. This shall be exhibited in the drawing.

06.08 **Sample, Drawing & Literatures:** - The bidder must be submitted Sample of 11KV 200 Amps. A.B. Switch at NESCO Utility store, Balasore during submission of bid bid. Drawing & literatures of the materials with sample receipt copy should be furnished with the bidding documents.

06.09 The details of construction and materials of different parts of the A.B. Switch shall clearly be indicate in the tender and illustrative pamphlet / literature for the same shall be submitted along with the tender.

#### 07.0 **TEST & TEST CERTIFICATE:** -

07.01 **Type Test:** - Certificate for the following type tests conducted on a prototype set of A.B. Switch in a NABL approved test house/CPRI shall have to be submitted along with offer.

Dielectric Test (impulse and one minute were power frequency withstand voltage test.)

- Temperature rise test (for contracts and terminals)
- Shorts Time current and peak withstand current test.
- Mainly active load breaking capacity test.
- Transformer off-load breaking capacity test.
- Line charging breaking capacity test.
- Cable charging breaking test.
- Operation and mechanical endurance test.
- Mechanical strength test for post insulator, as per IS-2444/1937 shall be furnished.
- Test for galvanization of metal (ferrous) parts.

07.02 **Routine /Acceptance Test:** -

The inspection may be carried out by the Purchaser at any stage of manufacture. The successful bidder shall grant free access to the Purchaser's representative at a reasonable time when the work is in progress. The following routine tests shall have to be conducted on each set and results are to be

furnished for consideration of deputing inspecting officer for inspection and conduction testing of the materials at the works of the manufacturer. the supplier shall give fifteen days advance intimation to the Purchaser to enable him to depute his representative for witnessing the tests.

1. Power frequency voltage dry test.
2. Measurement of resistance of main circuit.
3. Tests to prove satisfactory operation.
4. Dimension Check
5. Galvanization test.
6. Operational test.

**08.00 Guaranteed Technical Particulars: -**

The bidder shall furnish the guaranteed technical particular duly filled in the format along with the tender.

**09.0 Completeness of Equipment: -**

All fittings, accessories of apparatus which may not have been specifically mentioned in this specification but which are usual or necessary in equipment of similar plat shall be deemed to be included in the specification and shall be supplied by the Tender without extra charge. All plant and equipment shall be completed in all details whether such details are mentioned in the specification or not.

**11 KV 200 Amp 3 Pole AB Switch**

**Guaranteed Technical Particulars**

Sl. No	Particulars	Requirement	Bidders offer
			<b>3 pole</b>
1	Maker's name & Address	To be specified by the bidder	
2	Type of Switch	Rotating Type	
3	Suitable for mounting	Horizontal only	
4	No. of Breakers per phase	Single Break	
5	No. of Post Insulators per phase	2nos. of 12KV Post Insulators as per IS:2544/73 per phase	
6	<b>Post Insulators</b>	To be specified by the bidder as per CPRI Test Report	
(a)	Maker's Name & Country of Manufacture of Post Insulator		
(b)	Type of cementing	Original Cementing. The insulator to be cemented with MCI (Hot dip galvanized /Al Alloy cap and MCI/Forged steel hot deep galvanized pedestral) as per IS: 2544/1973	
(c)	Power frequency withstand voltage (Dry)	35 KV RMS	

(d)	One minute Power frequency withstand voltage (wet)	35 KV RMS	
(e)	Visible discharge voltage	9KV RMS	
(f)	Dry flash over voltage	85 KV	
(g)	Power frequency puncture withstand voltage	1.3 times of actual dry flash over voltage	
(h)	Creepage distance	320 mm minimum (ISS-2544/1973 & relevant IEC)	
(7)	Impulse withstand voltage for positive & negative polarity (1.2/50 micro second wave)		
(a)	Across the isolating distance	85KV Peak	
(b)	To earth & between poles	75KV Peak	
8	Rated one minute Power frequency withstand voltage		
(a)	Across the Isolating distance	32KV(RMS)	
(b)	To earth & between poles	28KV(RMS)	
9(a)	Rated voltage nominal/ maximum	11/12KV	
(b)	Rated normal current and rated frequency	200 Amps. 50hz	
10	Rated short-circuit making capacity	25KA (Peak)	
11	Rated Short-time current	10KA	
12	Rated peak withstand current	40KA	
13	Rated mainly active load breaking capacity	200 Amp.(RMS)	
14	Rated Transformer off load breaking capacity	6.3 Amp.(RMS)	
15	Rated line charging breaking capacity	2.5 Amp(RMS)	
16	Minimum clearance between adjacent phase		
(a)	Switch closed (center to center)	760mm	

(b)	Switch opened (Center of post insulator to the edge of the blade)	380mm	
17	<u>Temperature rise</u> The Temperature rise should not exceed the maximum limit to 65°C at an ambient temperature not exceeding 40°C	65°C	
	Copper contacts silver faced terminal of switch intended to be conducted to external conductor by bolts or screws at an ambient temperature should not exceed.	50°C	
18	Vertical clearance from top of insulator cap to mounting channel.	254 mm	
19	Type of contact	<p>a) Self aligned high pressure jaw type fixed contacts of electrolytic copper of size 70 mm x 35mm x 6 mm duly silver plated . Each contact should be riveted with three nos. copper rivets with a bunch ( minimum 3 mm thick) of copper strips /foil each may vary from 0.15 mm to 0.25 mm to and total thickness of copper foil per jaw should be 6 mm . Jaw assemblies are to be bolted through brass bolts and nuts with spring washer.</p> <p>Solid rectangular blade type moving contact of electrolytic copper of size 35 mm X 6 mm and length 220 mm duly silver plated ensuring a minimum deposit of silver 10 micron on copper contacts or as may be prescribed under relevant ISS / IEC .</p> <p>Pressure springs are to be used in each jaw contacts should be phosphorous bronze having 8nos. of turns X 28mm heights X14.4mm diameter with 14 SWG wire .</p>	
17	Connectors:-	Terminal connectors for both movable and fixed should be of copper flat of same size similar to that of moving contact blades (minimum 95% copper composition). The fixed connector shall of size 65 mm x 35 mm x 6 mm and the size of movable connector shall be size (65 X 35) X (65 X 35) X 6mm with machine finishing duly silver plated with 2 nos. 12mm dia holes provided with suitable brass bolts and double nuts, flat washers & 2nos. bimetallic solder less sockets suitable upto 80 mm <sup>2</sup> conductor.	



18	Moving contact supporting angle	Moving contact is to be supported by G.I angle of size 40x40x5 mm on each phase and the moving contact are to be bolted through 2 nos. stainless steel bolts and nuts with suitable stainless steel flat and spring washers.															
19	Galvanization	a) Iron parts shall be hot dip galvanized as per IS-2633/1972.(Latest Amendment) , IS :2629/1985 (1 <sup>st</sup> . Revision),															
		b) The pipe shall be galvanized as per IS-4736/1968.(Latest Amendment)															
20 (a)	Phase Coupling Rod	25mm nominal bore G.I. Pipe (Medium gauge)															
(b)	Operating Rod	ISI mark 32mm nominal bore G.I. Pipe (Medium gauge) 6 mtr. long  <table border="1"> <thead> <tr> <th rowspan="2">Normal</th> <th colspan="2">Outside Dia. in mm</th> <th rowspan="2">Wall thickness</th> </tr> <tr> <th>Max.</th> <th>Min.</th> </tr> </thead> <tbody> <tr> <td>25 mm</td> <td>34.2</td> <td>33.3</td> <td>3.25</td> </tr> <tr> <td>32 mm</td> <td>49.9</td> <td>42</td> <td>3.25</td> </tr> </tbody> </table>	Normal	Outside Dia. in mm		Wall thickness	Max.	Min.	25 mm	34.2	33.3	3.25	32 mm	49.9	42	3.25	
Normal	Outside Dia. in mm			Wall thickness													
	Max.	Min.															
25 mm	34.2	33.3	3.25														
32 mm	49.9	42	3.25														
(c)	Arcing Horn	8 mm dia G.I. rod with spring assisted operation.															
(d)	Force of fixed contact spring	50lbs to 75 lbs															
(f)	Bearings	4 nos. self lubricated bearing to be provided with grease nipple including 4th bearing being a axial thrust bearing.															
(g)	Locking Arrangement	Pad Lock and key arrangement at both “ON & OFF” position..															
(h)	Earth terminal	Provided at base channel at opposite ends.															
(i)	Copper braided flexible tapes	320mm long 2no. tin coated copper braided flexible tape both end seated with copper sheets duly punched for fixing having minimum weight of 450 grams per meter without sockets.															
(j)	Quick break device	Lever mechanism															

(k)	'T' connector	The 'T' connector provided on the channel having 'Moving Contact' shall be of G.I Nut & Bolt at the bottom end to facilitate replacement of this unit only during requirement and avoid entire change of the arm.	
l)	I-Bolt	The 'I-Bolt' shall be longer with 75 mm thread.	
21	Supporting Channel	75mmx40mmx 6mm M.S.Channel. (Hot dip galvanized)	
22	Weight of each pole	20 Kg (Approximately) ( to be specified by bidder)	
23	Detailed drawing submitted ?	To be provided by bidders	
<b>N.B</b>	i) Ferrous parts shall be duly galvanized as per IS :2629/1985 (1 <sup>st</sup> . Revision), (Amendment-2) and non-ferrous parts shall be silver plated.		
	ii) The G.I pipes and rods shall be galvanized as per IS:4736/1968 (1 <sup>st</sup> . Revision), (Amendment-1) for hot-dipped zinc coating on M.S. Tube.		
	iii) Certificate from a Government approved laboratory regarding composition of copper in electrolytic copper casting of materials should be submitted during inspection of materials at the cost of tenderer.		
	iv) Items not covered in the G.T.P, but relevant in Design, manufacturing, quality control & testing of materials shall be governed by the relevant IS with latest Amendment.		

**NB- Every AB Switch should bear the marking of manufacturer's name ,Purchaser's name , P.O. No., Sl. No. etc.**

**Name & Signature of Bidder with seal**

### **11 KV V Cross Arm (GI) :**

The Cross arm is to be made out of ISMC 75x40 with 50mmx6mm flat packing on top & bottom flange of the channel where the insulator pin is to be mounted conforming to REC construction standard & drawing . Galvanized the V cross arm as per IS-2633/1972.(Latest Amendment) , IS :2629/1985 (1<sup>st</sup>. Revision).

#### **Guaranteed Technical Particulars of 11KV 'V' Cross Arm**

<b>Sl. No.</b>	<b>Description</b>	<b>Specified</b>	<b>Bidders Offer</b>
1	Type of Cross Arm	ISMC 75x40	
2	Channel Weight	7.14 Kg/mtr	
3	Grade of Steel	FY 250	
4	Steel Standard	IS:2062-1992	
5	Fabrication Standard	IS:802 (part - 2) - 1978	
6	Dimension	(75x40x4.8)mm	
7	Size of M S Flat welded at both ends	50x8mm	
8	Steel Tensile Strength	1500kgf/cm <sup>2</sup>	
9	Working Load	200/300/350/400Kg	
10	Total Weight (with tolerance per meter $\pm$ 4%)	11.2 Kg (approx.)	

### **Back Clamp for 11 KV 'V' Cross arm (GI):**

Back clamp for 11 KV 'V' cross arm made out of 50x8 mm MS Flat & hot dip galvanize as per IS-2633/1972.(Latest Amendment) suitable for 9mx300 Kg PSC poles conforming to REC construction standard & drawing.

**11 KV F Clamp / Pole top Bracket (GI) :**

11 KV line pole top bracket made out of 50x8 mm M.S Flat & hot dip galvanize as per IS-2633/1972.(Latest Amendment) , confirming to REC Construction Standard.A-7 & drawing .

**GUARANTEED TECHNICAL PARTICULARS FOR 11KV POLE TOP BRACKET**

Sl.No.	Constructional Features	Specified	Bidders Offer
1.	Material used	50x8 mm MS Flat	
2.	Overall height	385 mm	
3.	Flange Width (one welded & one bent)	60 mm	
4.	Spacing between two flanges	75mm	
5.	Spacing of 2 nos of 18mm holes for fixing on pole top	100mm	
6.	C/L Distance of 2nos of 22mm holes on top flanges of the bracket.	25mm from edge of the flange.	
7.	ISS	2062	
8.	Drawing	enclosed	

**Name & Signature of Bidder with seal**

**Back Clamp for 11 KV 'V' Cross arm( MS) :**

Back clamp for 11 KV 'V' cross arm made out of 50x8 mm MS Flat suitable for 8mx200 Kg PSC poles & 9mx300 Kg PSC poles After fabrication the cross arm shall be painted with two coats of Red Oxide primer, conforming to REC construction standard & drawing

**Clamp for HT Stay set (MS) :**

HT stay clamp suitable for PSC poles made out of 50x8 mm MS Flat & painted with two coats of Red Oxide primer, confirming to latest IS Specification.

**Clamp for LT Stay set (MS) :**

LT stay clamp suitable for PSC poles made out of 50x6 mm MS Flat & painted with two coats of Red Oxide primer, confirming to latest IS Specification.

## **Suspension Clamp:**

### **TECHNICAL SPECIFICATIONS FOR SUSPENSION CLAMPS**

#### **Scope**

This specification covers the design, manufacture, assembly, testing and supply of Accessories for suspending Aerial Bunched Cables rated 1100 volts and insulated with cross-linked polyethylene and aluminum alloy bare messenger.

	Description	Application
a)	Suspension Clamp (as per REC Construction standard E-34) suitable for bare messenger AB cable (35-70 sq mm)	For supporting a length of ABC at an intermediate pole in a length, with small angle of deviation.

#### **Cable Data**

The standard sizes and characteristics of the phase and street lighting conductors, bare messenger wires shall be as specified in IS: 14255-1995 and REC Specification 32/1984 of following sizes

- a) 3x95 (Insulated Phase)+1x70(Bare Messenger)+1x16(Insulated street lighting) sq.mm
- b) 3x50 (Insulated Phase)+1x35(Bare Messenger)+1x16(Insulated street lighting) sq.mm
- c) 3x50 (Insulated Phase)+1x35(Bare Messenger)
- d) 3x35 (Insulated Phase)+1x25(Bare Messenger )+1x16(Insulated street lighting) sq.mm

#### **GENERAL REQUIREMENTS**

1. Suspension clamp shall be made of aluminum alloy of designation 4635 (IS : 617-1975) of tensile strength greater than  $200 \text{ N/mm}^2$  ( $20.5 \text{ kgf/ mm}^2$ ) and shall be capable of holding aluminum alloy messenger wire of 35 sq mm or 70 sq mm compacted AAA Conductor. The eye hooks shall be made of forged steel (IS: 2004) or mild steel (IS: 1570).
2. The clamp shall be provided with black weather-resistant plastic coating of at least 1mm thickness to prevent the insulation of the phase conductors from chafing due to rubbing against the clamp.
3. Suspension clamp assembly shall provide sufficient flexibility to allow free movement of the clamp at both straight runs and angle locations.
4. The suspension clamp and hardware shall have good finish and shall be free from all flaws, sharp radii of curvature and the edges shall be suitably rounded off.
5. All ferrous fittings, eye hooks, bolts, nuts and washers shall be galvanized with Zinc conforming to grade Zn 98 of IS: 209-1966. The spring washers and nuts etc. may be electro-galvanized. Nuts shall be made of material conforming to property Class 4.8 of IS:1367-1967 for its mechanical properties.

## TEST REQUIREMENTS

1. Slip strength shall not be less than 25% of the tensile strength of the messenger wires of 25mm<sup>2</sup> and 35mm<sup>2</sup> sizes having tensile strengths of 7.4 KN and 10.3 KN respectively (tests to be made separately for the two sizes).
2. Mechanical test – Tensile strength at right angle to the direction of messenger wire shall not be less than 15 KN.

## TESTS

The suspension clamp shall be subjected to the following tests in accordance with the latest version of IS:2486 (Part-I). Sampling plan as per clause no 8.0 above.

<u>Type Tests</u>	<u>Acceptance Tests</u>	<u>Routine Tests</u>
1. Slip strength test	1. Verification of dimensions	
2. Mechanical test	2. Galvanising test	1. Visual examination test
3. Verification of dimensions	3. Mechanical test	
4. Galvanising test		
5. Visual examination test		

### NOTES :

- I. Permissible tolerance shall be  $\pm 5\%$  on the indicated dimensions.
- II. The supplier of the clamps shall provide necessary facilities at his works for the acceptance tests.

## Marking / Embossing

Anchoring Clamp, Suspension clamp should bear

- Manufacturers trade mark and logo
- Purchaser, NESCO
- Product Code or Reference
- Traceability Code/Batch Number

## Drawings & Samples:

GA drawing and other particulars along with samples are to be submitted along with offer.

<b>GUARANTEED TECHNICAL PARTICULARS FOR SUSPENSION CLAMP FOR BARE MESSENGER WIRE</b>		
<b>Sl. No.</b>	<b>Description</b>	<b>Guaranteed particulars to be submitted by the Bidder along with offer</b>
1	Name and address of the manufacturer	
2	Applicable standard	
3	Type of clamp	
4	Type of design	
5	Voltage Grade(kV)	
6	Type & grade (metallic/non-metallic material)	
8	Type of hot dip galvanizing & thickness of Zinc coating	
9	Marking	
10	Colour of non-metallic parts	
11	Dimensions	
12	Approximate weight	
13	Minimum Breaking Load (KN)	
14	Maximum allowable load(KN)	
15	Max. angle of deviation of conductor (degrees)	
16	Method of casting	
17	Are GA drawing & samples enclosed	

**Name & Signature of Bidder with seal**

## **Dead End Clamp:**

### **TECHNICAL SPECIFICATIONS FOR ANCHOR (DEADENDCLAMP)**

#### **Scope**

This specification covers the design, manufacture, assembly, testing and supply of Accessories for anchoring Aerial Bunched Cables rated 1100 volts and insulated with cross-linked polyethylene and aluminum alloy bare messenger.

	Description	Application
a)	Dead end Clamp ( as per REC Construction standard E-35) suitable for bare messenger AB cable (35-70 sq mm)	For fitting onto a pole for anchoring the end of a length of ABC, or for a major change in direction.

#### **Cable Data**

The standard sizes and characteristics of the phase and street lighting conductors, bare messenger wires shall be as specified in IS: 14255-1995 and REC Specification 32/1984 of following sizes

- a) 3x95 (Insulated Phase)+1x70(Bare Messenger)+1x16(Insulated street lighting) sq.mm
- b) 3x50 (Insulated Phase)+1x35(Bare Messenger)+1x16(Insulated street lighting) sq.mm
- c) 3x50 (Insulated Phase)+1x35(Bare Messenger)
- d) 3x35 (Insulated Phase)+1x25(Bare Messenger )+1x16(Insulated street lighting) sq.mm

#### **GENERAL REQUIREMENTS**

1. The Dead End clamp shall be made of high strength Aluminium Alloy of designation 2280 (IS:617-1975) of tensile strength not less than  $250 \text{ N/mm}^2$  ( $27 \text{ kgf/mm}^2$ ). The U-bar shall be made of hot dip galvanised steel. The eye-hooks shall be made of forged steel (IS:2004) or mild steel (IS:1570).
2. The clamp shall be suitable for holding both  $35\text{mm}^2$  and  $70\text{mm}^2$  messenger wire sizes of compacted diameters of 7.62mm and 10.8 mm.
3. The clamp shall have a cone for holding the messenger wire and it shall automatically grip the messenger wire due to tension of the wire.
4. The clamp shall be free from all flaws, irregularities and sharp radii of curvature.
5. All ferrous fittings, eye hooks, bolts, nuts and washers shall be galvanised with Zinc conforming to grade  $Z_{n-98}$  of IS:209-1966. The spring washers and nuts etc, may be electro-galvanised. Nuts shall be made of material conforming to property class 4.8 of IS:1367 for its mechanical properties.

#### **TEST REQUIREMENTS**

1. Slip strength shall not be less than 90% of the tensile strength of the messenger wires of  $35\text{mm}^2$  and  $70\text{mm}^2$  sizes having tensile strengths of 7.4 KN and 10.3 KN respectively (tests to be made



separately for the two sizes).

2. The mechanical strength of the Dead End clamp shall not be less than 2000 Kg. The test shall be made separately for the clamp and the eye hook.

**TESTS**

The Dead End clamp shall be subjected to the following tests in accordance with the latest version of IS:2486(part-10. Sampling plan shall be as per clause no.08.

- | <u>Type Tests</u>             | <u>Acceptance Tests</u>       | <u>Routine Tests</u>       |
|-------------------------------|-------------------------------|----------------------------|
| a. Slip strength test         | a. Verification of dimensions | a. Visual examination test |
| b. Mechanical test            | b. Galvanising test           |                            |
| c. Electrical resistance test | c. Mechanical test            |                            |
| d. Heating cycle test         |                               |                            |
| e. Verification of dimensions |                               |                            |
| f. Galvanising test           |                               |                            |
| g. Visual examination test    |                               |                            |

**NOTES**

- I. Permissible tolerance shall be  $\pm 5\%$  on the dimensions indicated.
- II. The supplier of dead-end clamps shall provide necessary facilities at his works for the acceptance tests.

**Marking / Embossing**

Anchoring Clamp, Suspension clamp should bear

- Manufacturers trade mark and logo
- Purchaser, NESCO Utility
- Product Code or Reference
- Traceability Code/Batch Number

**Drawings & Samples:**

GA drawing and other particulars along with samples are to be submitted along with offer.

<b>GUARANTEED TECHNICAL PARTICULARS FOR DEAD END CLAMP FOR BARE MESSENGER WIRE</b>		
Sl..	Description	Guaranteed particulars to be submitted by the Bidders
1	Name and address of the manufacturer	
2	Applicable standard	
3	Type of clamp	
4	Type of design	
5	Voltage Grade(kV)	

6	Type & grade (metallic/non-metallic material)	
7	Type of hot dip galvanizing & thickness of Zinc coating	
8	Marking	
9	Colour of non-metallic parts	
10	Dimensions	
11	Approximate weight	
12	Ultimate tensile strength(KN)	
13	Maximum allowable load(KN)	
14	Slip Strength (KN)	
15	Method of casting	
16	Operating temperature (deg.cent)	
	a) Continuous Operation	
	b) Short circuit condition	
17	Are GA drawing & samples enclosed	

**Name & Signature of Bidder with seal**

## **Pole Clamp with Eye Hook:**

### **1.0 EYEHOOKS**

- a) Eye hooks shall be of Hot dip GI as per REC construction standard E-35 (Type – A)
- b) It should be made of forged hot dip galvanized steel as per IS-1570
- c) The clamp corrosion resistance should conform to standards IS 2629 & IS 2633.
- d) Minimum breaking Load should be 20 KN.

#### 1.1 Type Test

- a) Mechanical strength
- b) Galvanizing test

#### 1.2 Acceptance Tests

- a) Verification of dimensions. b) Galvanizing test
- c) Minimum breaking load (KN)

The Acceptance Tests are to be conducted as per REC Spec. and as per relevant IS Specifications & sampling plan as per clause no.08 above.

1.3 Drawings & Samples:

GA drawing, GTP and other particulars along with samples are to be submitted along with offer.

<b>Guaranteed Technical Particulars of Eye Hook</b>		
Sl. No.	Description	Guaranteed Technical Particulars submitted by the bidder
1	Name and Address of the Manufacturer	
2	Type of Hooks	
3	Type of Hot Dip Galvanizing Thickness of Zinc Coating	
4	Dimensions in mm	
5	Net Weight in Kg	
6	Ultimate tensile strength	
7	Are GA drawing & samples enclosed	

**Name & Signature of Bidder with seal**

**16 mm dia. Hexagonal Bolts & Nuts and Washer (GI):**

16 mm diameter MS Nuts and Bolts black hexagonal As per IS: 1387 (Part-II) Gr.-4/4.6 of following size. 16mmx150mm GI Nut & Bolt & hot dip galvanize as per IS-2633/1972.(Latest Amendment).

**Specification finished products:**

1. The bolts & Nuts shall be ISI Marked Mild Steel of Black Grade “B” and shall be round with hexagonal head.
  - (i) The Bolts and Nuts shall be manufactured by Hot/Cold forging process neatly and cleanly finished and shall have metric threads as per IS : 4218/1967 with its latest amendments.
  - (ii) The dimensions of the bolts & nuts and tolerances should conform to IS: 1363 with their latest amendments in all respect. The eccentricity and angular errors of various elements shall be within specified limits as per IS: 1367/1967 with its latest amendments the bolts & nuts shall be free from forging and threading defects such as cuts, spats. burns, bulging taper eccentricity, loose fill etc. which may affect their serviceability.
  - (iii) The colt heads and nuts shall be chamfered on one face only and other face shall be machined made.

(iv) Mechanical property requirement of tester shall conform to IS: 1367 (Part-III) 1979 property class 4.6 for bolts & property class-5 for nuts as per IS: 1367 (Part VI) —1980.

(v) The bolts & nuts shall be supplied in well-cleaned conditions and suitably protected against corrosion in individual bags of 50 Kgs.

#### **ACCEPTANCE TESTS:**

The bidder should furnish test certificate from recognized Govt. Laboratory ( NABL accredited) giving the results of tests as per IS: 1367 (Part-III) —1979 & IS: 1367 (Part-VI) 1980 The test certificate shall be in respect of the following for all sizes of both bolts & nuts as applicable given below:-

- i) Dimensional particulars (Sampling Ifl accordance with IS: 2614 for both bolts & nuts (Tolerance as per drawing).
- ii) Tensile strength test on full size (for bolts minimum 400 NI Sq.mm and for Nuts Proof Stress test Mm 610 N/Sq. mm).
- iii) Power load test on full size bolts and M-12-51400 N for 15 Sec.
- iv) Head soundness tests for bolts (no fracture).
- v) Brinell hardness tests or Rockwell Hardness or Vickers's Hardness tests for bolts min- 114 & max. 209 or mm. 67 & max. 95 or mm. 120 & max. 220 respectively. For nuts Vickers's Hardness mm. 130 & max. 302.

**Markings:** On the bolt head, there shall be identification marking of the manufacturer as well as property class '4.6'.

If possible property class "5" shall be marked on Nuts also. Further 'ISI' mark shall be marked on Gunny Bags for proper identification.

### **16mm LT Stay Set(GI):**

#### **TECHNICAL SPECIFICATION OF LT SET**

**SCOPE:** This specification covers design, manufacture, testing and dispatch of LT Stay Sets of 16 mm dia.

#### **GENERAL REQUIREMENTS**

##### **16 MM Dia Stay sets (Galvanized) – LT Stay Set**

This stay sets (Line Guy set) will consist of the following components:-

##### **Anchor Rod with one washer and Nut**

Overall length of rod should be 1800 mm to be made out of 16 mm dia GI Rod, one end threaded up to 40 mm length with a pitch of 5 threads per cm and provided with one square GI

washer of size 40X40x1.6mm and one GI hexagonal nut conforming to IS:1367:1967 & IS:1363:1967. Both washer and nut to suit threaded rod of 16 mm dia. The other end of the rod to be made into a round eye having an inner dia of 40mm with best quality welding.

#### **Anchor Plate Size 200 x 200 x6 mm**

To be made out of GI plate of 6 mm thickness. The anchor plate should have at its centre 18 mm dia hole.

#### **Turn Buckle & Eye Bolt with 2 Nuts**

To be made of 16 mm dia GI Rod having an overall length of 450mm, one end of the rod to be threaded up to 300 mm length with a pitch of 5 threads per cm and provided with two GI Hexagonal nuts of suitable size conforming to IS:1363:1967 & IS:1367:1967. The other end of rod shall be rounded into a circular eye of 40mm inner dia with proper and good quality welding.

#### **Bow with Welded Angle**

To be made out of 16mm dia GI rod. The finished bow shall have an over all length of 995 mm and eight of 450 mm, the apex or top of the bow shall be bent at an angle of 10 R. The other end shall be welded with proper and good quality welding to a GI angle 180 mm long having a dimension of 50x50x6mm. The angle shall have 3 holes of 18 mm dia each.

#### **Thimble**

To be made on 1.5 mm thick GI sheet into a size of 75x22x40mm and shape as per standard shall be supplied.

Average Weight of Finished 16mm Stay Sets shall be at least 7.702 KG (Minimum)  
(Excluding Nuts Thimbles and Washer) 8.445 Kg. (Maximum)

#### **Galvanizing**

The complete assembly shall be hot dip galvanized.

#### **Welding**

The minimum strength of welding provided on various components of 16mm and 20 mm dia stay sets shall be 3100 kg & 4900 kg respectively. Minimum 6mm fillet weld or its equivalent weld area should be deposited in all positions of the job i.e. at any point of the weld length. The welding shall be conforming to relevant IS: 823/1964 or its latest amendment.

#### **Threading**

The threads on the Anchor Rods, Eye Bolts and Nuts shall be as per specification IS:4218:1967 (ISO Metric Screw Threads). The Nuts shall be conforming to the requirements of IS:

1367:1967 and have dimension as per IS 1363:1967. The mechanical property requirement of fasteners

shall confirm to the properly clause 4.6 each for anchor rods and Eye bolt and property clause 4 for nuts as per IS: 1367:1967.Average weight of finished 20 mm Stays Set: 14.523 Kg.(Min) (Excluding Nuts Thimble & Washer) :15.569 Kg.(Max.)

**TESTS**

The contractor shall be required to conduct testing of materials at Govt./Recognized testing laboratory during pre-dispatch inspection for Tensile Load of 3100 Kg/4900Kg. applied for one minute on the welding and maintained for one minute for 16 mm and 20mm dia stay sets respectively.

**IDENTIFICATION MARK**

All stay sets should carry the identification mark of the Purchaser (NESCO) applicable.

This should be engraved on the body of stay rods to ensure proper identification of the materials. The nuts should be of a size compatible with threaded portion of rods and there should be not play or slippage of nuts.

Welding wherever required should be perfect and should not give way after erection.

**TOLERANCES**

The tolerances for various components of the stay sets are indicated below subject to the condition that the average weight of finished stay sets of 16mm dia excluding nuts, thimbles and washers shall not be less than the weight specified above.

**GURANTEED TECHNICAL PARTICULARS OF LT STAY SET:**

Sl No.	Item Description	Specified Parameters			Bidder's Offer
		Section Tolerances	Fabrication Tolerances	Material	
1	Anchor Plate	6mm thick +2.5%-5%	200x200mm+1%	GI Plate 6 mm thick	
2	Anchor Rod	16mm dia +5%-3%	Length 1800mm+0.5% Rounded Eye 40 mm inside dia + 3% Threading 40mm+11%-5% Length	GI Round 16mm dia GI Round 16mm dia	

3	Turn Buckle Bow	16mm dia +5%-3%	Length 995mm+1% 16mm dia Length180mm+ 1% 50x50x6mm	GI Round 16mm dia. GI Angle	
4	Eye Bolt Rod	16mm dia +5%-3% 20mm dia +3% - 2%	Length 450mm + 1% Threading 300mm+1% Round Eye 40mm inside dia +3%	GI Round 16 mm dia	
5	Galvanisation thickness	All galvanization shall be carried out in accordance with IS: 2629 . The weight of Zinc deposited shall be in accordance with IS: 2629 and shall not less than 0.61 kg/m <sup>2</sup> with a minimum thickness of 86 microns for items of thickness more than 5 mm, 0.46kg/m <sup>2</sup> (64 microns) for items of thickness between 2 mm & 5 mm& 0.33kg/m <sup>2</sup> (47 microns) for items less than 2 mm thickness.			
a	Anchor Plate				
b	Anchor Rod				
c	Turn Buckle Bow				
d	Eye Bolt Rod				
6	Thimble	2 nos. to be made of 1.5 mm thick G.S Sheet into a size 75x22x40 mm & shape as per standard.			
7		One G.S Hexagonal Nut confirming to IS:1363 & 1367 with one square washer of size 50x50x6 mm (G.S) along with Anchor Rod.			
8		Two G.S Hexagonal Nuts of suitable size along with Eye Bolt Rod.			

**Name & Signature of Bidder with seal**

**7/10 GI Stay Wire :**

**7/12 GI Stay Wire :**

**TECHNICAL SPECIFICATIONS 7/10 SWG and 7/12 SWG STAY WIRE)**

**1. Application Standards**

Except when they conflict with the specific requirements of this specification, the G.I Stay Stranded Wires shall comply with the specific requirements of IS: 2141-1979. IS: 4826-1979 & IS: 6594-1974 or the latest versions thereof.

**2. Application and Sizes**

- a) The G.I. stranded wires covered in this Specification are intended for use on the overhead power line poles, distribution transformer structures etc.

- b) The G.I stranded wires shall be of 7/10 SWG( 7/3.15 mm for 11KV lines) and 7/12 SWG (7/2.5 mm for LT lines) standard sizes.

### 3. Materials

The wires shall be drawn from steel made by the open hearth basic oxygen or electric furnace process and of such quality that when drawn to the size of wire specified and coated with zinc, the finished strand and the individual wires shall be of uniform quality and have the properties and characteristics as specified in this specification. The wires shall not contain sulphur and phosphorus exceeding **0.060%** each.

#### 3.1 Tensile Grade

The wires shall be of tensile grade 4, having minimum tensile strength of 700 N/mm<sup>2</sup> conforming to IS:2141.

#### 3.2 General Requirements

- a) The outer wire of strands shall have a right-hand lay.  
 b) The lay length of wire strands shall be 12 to 19 times the strand diameter.

#### 3.3 Minimum Breaking Load & Galvanising

The minimum breaking load of the wires before and after stranding shall be as follows:

No. of Wires & Const.	Wire Dia (mm)	Min. breaking load of the Single wire before stranding (KN)	Min. breaking load of the standard wire (KN)
7 (6/1)	2.5	3.44	21.40
7 (6/1)	3.15	5.46	34.00
7 (6/1)	4.0	8.80	54.90
Minimum weight of zinc coating before stranding	490 gm/mm <sup>2</sup>	490 gm/mm <sup>2</sup>	490 gm/mm <sup>2</sup>
Minimum weight of zinc coating before stranding	475 gm/mm <sup>2</sup>	475 gm/mm <sup>2</sup>	475 gm/mm <sup>2</sup>

### 4. Construction

- a) The galvanized stay wire shall be of 7-wire construction. The wires shall be so stranded together that when an evenly distributed pull is applied at the ends of completed strand, each wire shall take an equal share of the pull.



b) Joints are permitted in the individual wires during stranding but such joints shall not be less than 15 metres apart in the finished strands.

c) The wire shall be circular and free from scale, irregularities, imperfection, flaws, splits and other defects.

**5. Tolerances**

A tolerance of ( $\pm$ ) 2.5% on the diameter of wires before stranding shall be permitted.

**6. Sampling Criteria**

The sampling criteria shall be in accordance with IS :2141.

**7. Tests on Wires before Manufacture**

i) The wires shall be subjected to the following tests in accordance with IS :2141.

a) Ductility Test

b) Tolerance on Wire Diameter

ii) **Tests on Completed Strand**

The completed strand shall be tested for the following tests in accordance with IS:2141.

a) Tensile and Elongation Test: The percentage elongation of the stranded wire shall not be less than 6%.

b) Chemical analysis

c) Galvanizing Test

The Zinc Coating shall conform to "Heavy Coating" as laid down in IS:4826

**8. Marking**

Each coil shall carry a metallic tag, securely attached to the inner part of the coil bearing the following information:

a) Manufacturers name or trade mark

b) Lot number and coil number

c) Size

d) Construction

e) Tensile Designation

f) Lay

g) Coating h)

Length

i) Mass

j) ISI certification mark, if any

**9. Packing**

The wires shall be supplied in 75-100 Kg. coils. The packing should be done in accordance with the provisions of IS:6594.

**GURANTEED TECHNICAL PARTICULARS STAY WIRE (7/10 SWG)**

Sl. No.	Description	Specified	Bidder's offer
1.	Manufacturer's name & address	To be specified by the Bidder	

2	Nominal diameter of wire in mm	3.15	
3	Tolerance in diameter in mm	$\pm 2.5\%$	
4	Minimum breaking load in Kg	3697.50	
5	Tensile strength Kgf/mm <sup>2</sup>	71.40	
6	Overall diameter of stranded wire in mm	9.45	
7	Sectional Area (in mm <sup>2</sup> .)	70.16	
8	Coating Test		
a	Type of zinc coating whether heavy or light	Heavy	
b	Weight of coating in g/m <sup>2</sup>	476	
9 a	Length of wire in each coil in mtr.	193	
b	Tolerance	$\pm 5\%$	
10	No. of dips the coating is able to withstand as $18 \pm 20^{\circ}\text{C}$	3 dip in min.	
11	Adhesion Test (Wrap Test at 1 turn per second coiling while stress not exceeding % nominal tensile strength)		
a	Min. complete turn of wrap	To be specified by bidder	
b	Dia of mandrel on which wrapped	- do -	
12	Bend Test		
a	Angle	- do -	
b	Dia round a format to be bent	- do -	
13	Freedom from defect	- do -	
14	Chemical composition the MS Wire used shall not exceed		
a	Sulphur 0.060%	- do -	
b	Phosphorous 0.065%	- do -	
15 a	Weight of each coil in Kg	70 to 100	
b	Tolerance	$\pm 5\%$	
16 a	Weight of wire in Kg/Km	465	
b	Tolerance	$\pm 5\%$	
17	Standard according to which the solid wire is manufactured and tested	ISS: 2141/1992 & ISS: 4826/1979	

**Name & Signature of Bidder with seal**

**GURANTEED TECHNICAL PARTICULARS STAY WIRE (7/12 SWG)**

Sl. No.	Description	Specified	Bidder's offer
1.	Manufacturer's name & address	To be specified by the Bidder	
2	Nominal diameter of wire in mm	2.50	

3	Tolerance in diameter in mm	± 2.5%	
4	Minimum breaking load in Kg	2331.07	
5	Tensile strength Kgf/mm <sup>2</sup>	71.40	
6	Overall diameter of stranded wire in mm	7.50	
7	Sectional Area (in mm <sup>2</sup> .)	44.19	
8	Coating Test		
a	Type of zinc coating whether heavy or light	Heavy	
b	Weight of coating in g/m <sup>2</sup>	476	
9 a	Length of wire in each coil in mtr.	298	
b	Tolerance	± 5%	
10	No. of dips the coating is able to withstand as 18 ± 20°C	3 dip in min.	
11	Adhesion Test (Wrap Test at 1 turn per second coiling while stress not exceeding % nominal tensile strength)		
a	Min. complete turn of wrap	To be specified by bidder	
b	Dia of mandrel on which wrapped	- do -	
12	Bend Test		
a	Angle	- do -	
b	Dia round a format to be bent	- do -	
13	Freedom from defect	- do -	
14	Chemical composition the MS Wire used shall not exceed		
a	Sulphur 0.060%	- do -	
b	Phosphorous 0.065%	- do -	
15 a	Weight of each coil in Kg	70 to 100	
b	Tolerance	± 5%	
16 a	Weight of wire in Kg/Km	310	
b	Tolerance	± 5%	
17	Standard according to which the solid wire is manufactured and tested	ISS: 2141/1992 & ISS: 4826/1979	

**Name & Signature of Bidder with seal**

### **Earthing Coil :**

#### **EARHTING COIL TECHNICAL SPECIFICATION**

#### **SCOPE :**

The specification covers design, manufacture, testing and dispatch to the owner's stores of Earthing Coils for use in earthing of the HT & LT poles.

#### **GENERAL REQUIREMENTS :**

Earthing coils shall be fabricated from soft GI Wire Hot Dip Galvanized. The Hot Dip galvanized wire shall have clean surface and shall be free from paint enamel or any other poor conducting material. The coil shall be made as per REC constructions standard.

The Hot Dip galvanizing shall conform to IS: 2629/1966, 2633/1972 and 4826/1969 with latest amendments.

**TESTS :**

**Galvanizing Tests**

Minimum Mass of Zinc

On GI Wire used 280 cm/m<sup>2</sup>

After Coiling-266 gm/m<sup>2</sup>.The certificate from recognized laboratory shall be submitted towards mas of zinc.

**Dip Test**

Dip test shall stand 3 dips of 1 minute and one dip of ½ minute before coiling and 4 dips of 1 minute after coiling as per IS: 4826/1979

**Adhesion Test**

As per ISS 4826 – 1979

**DIMENSIONAL REQUIREMENT**

- i) Nominal dia of GI Wire -4 mm (Tolerance±2.5%)
- ii) Minimum no. of turns – 115 Nos.
- iii) External dia of Coil (Min) – 50 mm
- iv) Length of Coil (Min) – 460 mm
- v) Free length of GI Wire at one end coil (Min.) – 2500 mm
- vi) The turns should be closely bound. Weight of one finished Earthing Coils (min.) – 1.850 Kg.

**Guaranteed Technical Particulars of Coil Earth**

Sl. No.	GENERAL TECHNICAL PARTICULARS	Bidder's Offer
1	Nominal diameter of wire	
2	No. of turns	
3	External dia of Coil	
4	Length of Coil	
5	Mass of Zinc	
6	Total weight of Coil	

7	Whether drawing enclosed (yes)	
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## **DANGER BOARD:**

### **TECHNICAL SPECIFICATION OF DANGER NOTICE BOARD :**

The danger plate shall be affixed in a permanent manner on operating side of the panel, Substations, Distribution Boards , Electric poles etc..

The danger notice plate shall indicate danger notice both in English , Odia & Hindi and with a sign of skull and bones.

The letter, the figure, the conventional skull and bones shall etc. shall be positioned on the plate as per recommendations of IS : 2551-1982.

The said letter, the figure and the sign of skull and bones be painted in single red colour as per IS : 5-1978.

**Standards of Danger Plate:** The Danger Notice Plates shall comply with IS:2551-1982 or the latest amendment.

The following tests shall be carried out on Danger Plate:

- I) Visual examination as per IS:2551-1982
- II) Dimensional check as per IS:2551-1982
- III) Test for weather proofness as per IS:8709-1977 (or its latest version)

## **11 KV PIN INSULATOR:**

### **1.SCOPE :**

The specification cover the manufacture, testing at works supply and delivery of Porcelain insulators for overhead power lines with a nominal voltage below 12KV . Both Pin and Shackle type insulators are covered.

### **2.APPLICABLE STANDARDS:**

Except when they conflict with the specific requirements of this specification, the insulators shall comply with IS : IS:731 & IS: 3188 or the latest version thereof.

### **3.GENERAL REQUIREMENTS:**

The porcelain shall be sound, free from defects, thoroughly vitrified and smoothly glazed. The design of the insulators shall be such that the stresses due to expansion and contraction in any part of the insulator shall not lead to its deterioration. The glaze shall be brown in color for insulators. The glaze

shall cover the entire porcelain surface parts except those areas that serve as supports during firing. The insulators shall be suitable for use with all Aluminum Conductor or Copper conductor or ACSR upto 100 sq.mm. The insulators should withstand the conductor tension the reversible wind load as well as the high frequency vibrations set due to wind.

#### 4. SYSTEM CONDITIONS:

Frequency	: 50 Hz
Nominal System Voltage	: 11KV
Maximum System Voltage LT System	: 12 KV
Minimum LT Voltage	: 11KV
Power frequency one minute withstand Voltage(wet)	: 35KV

#### 5. TYPE OF INSULATORS:

The standard Pin insulators shall be of designation Type –B of IS : 731 or its latest revision.

#### 6. TESTS:

##### 6.1 Type tests:

- a) Visual examination
- b) Verification of dimensions
- c) Temperature cycle test
- d) Dry one minute power frequency withstand test
- e) Wet one minute power frequency withstand test
- f) Mechanical strength test
- g) Porosity test

##### 6.2 Acceptance test:

The insulators, after having withstood the routine test shall be subjected to the following acceptance tests in the order given below:

- a) Verification of Dimensions.
- b) Temperature cycle test
- c) Mechanical strength test
- d) Porosity test

##### 6.3 Routine tests:

- ii) Visual examination

#### 7. TESTING FACILITIES:

- a. The Bidder must clearly indicate what testing facilities are available in the works of the

manufacturer and whether the facilities, are adequate to carry out all the routine as well as type tests. These facilities should be made available to Purchaser's Engineers if deputed to carry out or witness the tests. If any tests cannot be carried out at the manufacturer's works, the reasons should be clearly stated in the tender.

b. The Bidder shall furnish detailed type test reports of the offered 11KV Pine insulator as per clause 6.1 of this specification. All the above 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 the insulators offered meet the requirements of the specification. These Type Tests should have been carried out within five years prior to the date of opening of this tender.

c. There offered L.T. shackle Insulators & pin insulators are already fully Type Tested at Laboratories accredited by the National Accreditation Board of Testing and Calibration Laboratories (NABL) within five years prior to the date of opening of the tender.

There is no change in the design of Type tested L.T. shackle Insulators and those offers against this tender.

#### 8. **Drawings** :

The tender shall be accompanied with the detailed drawings showing the dimensions of the individual insulator, giving all the design dimensions of various component parts. Generally it shall be as per IS.

#### 9. **MARKING:**

a. Each insulator shall be legibly and indelibly marked to show the following:

- i) Name of Purchaser- NESCO
- ii) Name or trade mark of the manufacturer
- iii) Year of manufacturer
- iv) ISI certificate, mark, if any.

b. Marking on porcelain shall be applied before firing.

#### 10. **Packing** :

All insulators shall be packed in crates or boxes suitable for rough handling. Packing shall be marked with the strength and voltage rating.

**GUARANTEED TECHNICAL PARTICULARS 11 KV PIN INSULATOR**

Sl. No.	Description	Specific Requirement	Bidders offer
	Name of Manufacturer. & Address	To be specified by the bidder	
	Location of type testing	To be specified by the bidder	
	Applicable standard	IS: 731,IS 3188 or the latest version	
1	Normal working voltage	11 Kv (rms)	
2	High system voltage.	12 Kv (rms)	
3	Visible Discharge voltage dry PF.	9 Kv (rms)	
4	1 Minute withstand voltage wet PF.	65 Kv (rms)	
5	1 Minute withstand voltage.....	35 Kv (rms)	
6	PF puncture withstand voltage.	110 Kv (rms)	
7	Impulse withstand voltage :		
	(+ ve)	80 Kv peak	
	(- ve)	80 Kv peak	
8	Impulse flashover voltage :		
	(+ ve)	90 Kv peak	
	(- ve)	120 Kv peak	
9	Minimum failing load.	5 KN.	
10	Minimum creepage distance.	240 mm.	
11	Colour of glaze.	Brown.	
12	Weight per unit.	1.4 Kg. (Apprx.)	
13	Size of insulator. (Height)	125 mm.	
	(Diameter	125 mm.	
14	Material of thimble.	Lead.	
15	Steel head.	Small head.	
16	Standard.	IS : 731/1971.	
17	Tolerance.	Tolerance will be allowed as per IS : 731/1971 or latest amendments if any.	
18	Drawing	To be submitted	



19	Conforming standard	As per IS
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**NB- Every insulator should bear the marking of manufacturer's name & Purchaser's name and ISI mark.**

**Name & Signature of Bidder with seal**

**11KV 70 KN B&S DISC INSULATOR:**

**TECHNICAL SPECIFICATION OF 70KN (B&S) DISC INSULATOR**

**SCOPE:** This specification provides for design, manufacture, engineering, inspection and testing before dispatch packing and delivery FOR (destination) for Indian manufacturers of disc. Insulators as per technical requirements furnished in this specification.

These insulators are to be used in suspension and tension insulators strings for the suspension and anchoring of the bus-bar conductors.

Following is the list of documents constituting this package.

- (i) Technical specification.
- (ii) Technical data sheet.
- (iii) Drawings of insulators

All the above volumes along with amendments there of 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.

The insulators 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 material which in his judgment, is not in full accordance therewith.

**STANDARDS:**

Except as modified in this specification, the disc insulators shall conform to the following Indian Standards, which shall mean latest revisions and amendments. Equivalent International and Internally recognized standards to which some of these standards generally correspond are also listed below.

Sl. No.	Indian Standard	Title.	International Standard
1.	IS: 206	Method for Chemical Analysis of Slab Zinc.	
2.	IS: 209	Specification for Zinc.	BS: 3436

3.	IS: 731	Porcelain insulators for overhead power lines with a normal voltage greater than 1000V	BS: 137(I&II); IEC 274 IEC 383
4.	IS: 2071 Part-(I) Part-(II)	Method of High Voltage Testing.	
5.	IS: 2121  (Part-I)	Specification of Conductors and Earth wire Accessories for Overhead Power lines. Armour Rods, Binding wires and tapes for conductor.	
6.	IS: 2486	Specification for Insulator fittings for overhead power lines with a	
		1000V.	
	Part – I	General Requirement and Tests.	BS: 3288
	Part – II	Dimensional Requirements.	IEC: 120
	Part – III	Locking devices.	IEC: 372
7.	IS: 2629	Recommended practice for Hot Dip Galvanisation for iron and steel.	
8.	IS: 2633	Testing for Uniformity of Coating of Zinc coated articles.	
9.	IS: 3138	Hexagonal Bolts & Nuts.	ISO/R 947 & ISO/R272
10.	IS: 3188	Dimensions for Disc Insulators.	IEC: 305
11.	IS: 4218	Metric Screw Threads	ISO/R 681969 R 261963, R 262-1969 & R965-1969
12.	IS: 6745	Determination of weight of zinc coating on zinc coated iron and steel articles.	
13.	IS: 8263	Methods of RIV Test of HV insulators.	IEC 437 NEMA Publication No.107/1964 CISPR
14.	IS: 8269	Methods for switching impulse test on HV insulators.	IEC: 506
15.		Thermal mechanical performance test and mechanical performance test on string insulator units.	IEC: 575
16.	IEC	Long Rod Insulators	IEC-433

The standards mentioned above are available from:

Reference.	Abbreviation.	Name & Address:
BS		British Standards, British Standards Institution, 101, Pentonville Road, N-19
IEC / CISPR		International Electro technical commission Electro Technique International. 1, Rue de verembe
IS		Bureau of Indian Standards, Manak Bhavan, 9 Bahadurshah Zafar Marg, New Delhi-
ISO		International Organisation for Standardization. Danish Board of Standardization Dansk Standardizing Sraat Aurehoegvej-12 DK-2900 Helleprup
NEMA		National Electric Manufacturers Association 1`55, East 44 <sup>th</sup> . Street New York, NY 10017

## PRINCIPAL PARAMETERS.

### DETAILS OF DISC INSULATORS:

The Insulator strings shall consist of standard discs for use in three phases, 50 Hz 33/11KV S/S, 33 KV & 11KV Lines of NESCO Utility in a moderately polluted atmosphere. The discs shall be cap and pin, ball and socket type, radio interference and have characteristics as shown in Table-I and all ferrous parts shall be hot dip galvanized as per the latest edition of IS 2629. The zinc to be used for making sleeves shall be 99.95 % pure.

The size of disc insulator, minimum creepage distance the number to be used in different type of strings, their electromechanical strength and mechanical strength of insulator string along with hardware shall be as follows:

Sl. No	Type of String.	Size of disc. Insulator (mm)	Minimum creepage distance of each	No. of standard discs 33KV	Electro-mechanical strength of insulator string fittings (KN)
1.	Single	255x145	430	1x3	70KN/90KN Antifog Insulator
2.	Double	-do-	-do-	2x3	70KN/90KN Antifog Insulator
3.	Single Tension	280x170	320	1x4	70KN/90KN Normal Insulator
4.	Double Tension	-do-	-do-	2x4	70KN/90KN Normal Insulator

## **SPECIFICATION DRAWINGS:**

The specification in respect of the disc insulators are described. These specification for information and guidance of the Bidder only. The drawings to be furnished by the supplier shall be as per his own design and manufacture and in line with the specification.

## **GENERAL TECHNICAL REQUIREMENTS:**

### **Porcelain:**

The porcelain used in the manufacture of the shells shall be ivory white nonporous of high dielectric, mechanical and thermal strength, free from internal stresses blisters, laminations, voids, forgone matter imperfections or other defects which might render it in any way unusable for insulator shells. Porcelain shall remain unaffected by climatic conditions ozone, acid, alkalis, zinc or dust. The manufacturing shall be by the wet process and impervious character obtained by through verification.

The insulator shall be made of highest grade, dense, homogeneous, wet-process porcelain, completely and uniformly vitrified throughout to produce uniform mechanical and electrical strength and long life service. The porcelain shall be free from warping, roughness, cracks, blisters, laminations, projecting points foreign particles and other defects, except those within the limits of standard accepted practice. Surfaces and grooves shall be shaped for easy cleaning. Shells shall be substantially symmetrical.

### **Porcelain glaze:**

Surface to come in contact with cement shall be made rough by sand glazing. All other exposed surfaces shall be glazed with ceramic materials having the same temperature coefficient of expansion as that of the insulator shell. The thickness of the glaze shall be uniform throughout and the colour of the glaze shall be brown. The Glaze shall have a visible luster and smooth on surface and be capable of satisfactory performance under extreme tropical climatic weather conditions and prevent ageing of the porcelain. The glaze shall remain under compression on the porcelain body throughout the working temperature range.

## **METAL PARTS:**

### **(i) Cap and Ball Pins:**

Ball pins shall be made with drop forged steel caps with malleable cast iron. They shall be in one single piece and duly hot dip galvanized. They shall not contain parts or pieces joined together welded, shrink fitted or by any other process from more than one piece of materials. The pins shall be of high tensile steel, drop forged and heat-treated. The caps shall be cast with good quality black heart malleable cast iron and annealed. Galvanizing shall be by the hot dip process with a heavy coating of zinc of very high purity. The bidder shall specify the grade composition and mechanical properties of steel used for caps and pins. The cap and pin shall be of such design that it will not yield or distort under the specified mechanical load in such a manner as to change the relative spacing of the insulators or add other stresses to the shells. The insulator caps shall be of the socket type provided with nonferrous metal or stainless steel cotter pins and shall provide positive locking of the coupling.

### **(ii) Security Clips:**

The security clips shall be made of phosphor bronze or of stainless steel.

**FILLER MATERIAL:**

Cement to be used, as a filler material be quick setting, fast curing Portland cement. It shall not cause fracture by expansion or loosening by contraction. Cement shall not react chemically with metal parts in contact with it and its thickness shall be as small and as uniform as possible.

**MATERIALS DESIGN AND WORKMANSHIP:**

**GENERAL:**

All raw materials to be used in the manufacture of these insulators shall be subject to strict raw material quality control and to stage testing/ quality control during manufacturing stage to ensure the quality of the final end product. Manufacturing shall conform to the best engineering practices adopted in the field of extra high voltage transmission. Bidders shall therefore offer insulators as are guaranteed by them for satisfactory performance on Transmission lines.

The design, manufacturing process and material control at various stages be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish elimination of sharp edges and corners to limit corona and radio interference voltages.

**INSULATOR SHELL:**

The design of the insulator shells shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. Shells with cracks shall be eliminated by temperature cycle test followed by mallet test. Shells shall be dried under controlled conditions of humidity and temperature.

**METAL PARTS:**

- i. The twin ball pin and cap shall be designed to transmit the mechanical stress to the shell by compression and develop uniform mechanical strength in the insulator. The cap shall be circular with the inner and outer surfaces concentric and of such design that it will not yield or distort under loaded conditions. The head portion of the pinball shall be suitably designed so that when the insulator is under tension the stresses are uniformly distributed over the pinhole portion of the shell. The pinball shall move freely in the cap socket either during assembly of a string or during erection of a string or when a string is placed in position.
- ii. Metal caps shall be free from cracks, seams, shrinks, air holes, blowholes and rough edges. All metal surfaces shall be perfectly smooth with no projecting part or irregularities, which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stress uniformly. Pins shall not show any microscopically visible cracks, inclusions and voids.

**GALVANIZING:**

All ferrous parts, shall be hot dip galvanized in accordance with IS: 2629. The zinc to be used for galvanizing shall conform to grade Zn 99.5 as per IS: 209. The zinc coating shall be uniform, smoothly adherent, reasonably light, continuous and free from impurities such as flux, ash, rust stains, bulky white deposits and blisters. Before ball fittings are galvanized, all die flashing on the shank and on the bearing surface of the ball shall be carefully removed without reducing the designed dimensional requirements.

**CEMENTING:**

The insulator design shall be such that the insulating medium shall not directly engaged with hard metal. The surface of porcelain and coated with resilient paint to offset the effect of difference in thermal expansions of these materials. High quality Portland cement shall be used for cementing the porcelain to the cap & pin.

**SECURITY CLIPS (LOCKING DEVICES)**

The security clips to be used as locking device for ball and socket coupling shall be ‘R’ shaped hump type to provide for positive locking of the coupling as per IS: 2486 (Part-IV). The legs of the security clips shall allow for spreading after installation to prevent complete withdrawal from the socket. The locking device shall resilient corrosion resistant and of sufficient mechanical strength. There shall be no possibility of the locking device to be displaced or be capable of rotation, which placed in position, and under no circumstances shall it allow separation of insulator units and fittings. ‘W’ type security clips are also acceptable. The hole for the security clip shall be counter sunk and the clip shall be of such design that the eye of the clip may be engaged by a hot line clip puller to provide for disengagement under energized conditions. The force required for pulling the clip into its unlocked positions shall not be less than 50 N (5 kg.) or more than 500 N (50 kgs.).

**MARKING:**

Each insulator shall have the rated combined mechanical and electrical strength marked clearly on the porcelain surface. Each insulator shall also bear symbols identifying the manufacturer, month, and year of manufacture. Marking on porcelain shall be printed, not impressed, and shall be applied before firing.

**BALL AND SOCKET DESIGNATION:**

The dimensions of the ball and sockets for 70 and 90 KN discs shall be of 16 mm and for 120 KN and 160 KN discs shall be of 20 mm designation in accordance with the standard dimensions stated in IS: 2486 (Part-II).

**DIMENSIONAL TOLERANCE OF INSULATOR DISCS:**

It shall be ensured that the dimensions of the disc insulators are within the limits specified below:

a) Diameter of Disc (mm)

	Standard	Maximum	Minimum
70 KN Disc	255	266	244
90 KN Disc	255	266	244

b) Ball to Ball spacing Between Discs (mm)

	Standard	Maximum	Minimum
70 KN Disc	145	149	141
90 KN Disc	145	149	141

**INTERCHANGEABILITY:**

The insulators inclusive of the ball and socket fittings shall be of standard design suitable for use with hardware fittings of any make conforming to relevant Indian Standards.

#### **FREEDOM FROM DEFECTS:**

Insulators shall have none of the following defects:

- 1) Ball pin shake.
- 2) Cementing defects near the pin like small blow holes, small hair cracks lumps etc.
- 3) Sand fall defects on the surface of the insulator.

#### **INSULATOR STRINGS:**

##### **TYPE AND RATING:**

The insulator strings shall be formed with standard discs described in this specification for use on 3 phases 33 KV 50 Hz effectively earthed systems in an atmosphere with pollution level as indicated in project synopsis. Suspension insulator strings for use with suspension/tangent supports are to be fitted with discs 70 KN EMS rating while tension insulator strings for use with Anchor / Tension towers are to be fitted with discs of 90 KN EMS level rating.

##### **STRING SIZE:**

The sizes of the disc insulator, the number to be used in different types of strings, their electro- mechanical strength and minimum nominal creep age distance shall be as given in this specification

Insulator units after assembly shall be concentric and coaxial within limits as permitted by Indian Standards.

The strings design shall be such that when units are coupled together there shall be contact between the shell of one unit and metal of the adjacent unit.

#### **DIMENSIONAL TOLERANCE OF INSULATORS DISCS**

It shall be ensured that the dimensions of the long rod insulators are within the limits as per relevant IEC/ISS.

#### **TESTS (FOR DISC INSULATORS) :**

The following tests shall be carried out on the insulator string and disc insulators.

##### **TYPE TEST:**

This shall mean those tests, which are to be carried out to prove the design, process of manufacture and general conformity of the material and product with the intents of this specification. These tests shall be conducted on a representative number of samples prior to commencement of commercial production. The Bidder shall indicate his schedule for carrying out these tests.

##### **ACCEPTANCE TESTS:**

This shall mean these tests, which are to be carried out on samples taken from each lot offered for pre-dispatch inspection for the purpose of acceptance of the lot.

#### **ROUTINE TESTS:**

This shall mean those tests, which are to be carried out on each insulator to check the requirements, which are likely to vary during production.

#### **TESTS DURING MANUFACTURE:**

Stage tests during manufacture shall mean those tests, which are to be carried out during the process of manufacture to ensure quality control such that the end product is of the designed quality conforming to the intent of this specification.

#### **TEST VALUE:**

For all type and acceptance tests the acceptance values shall be the value guaranteed by the bidder in the guaranteed technical particulars of the acceptance value specified in this specification of the relevant standard whichever is more stringent for that particular test.

#### **TEST PROCEDURE AND SAMPLING NORMS:**

The norms and procedure of sampling for the above tests shall be as per the relevant Indian

Standard or the internationally accepted standards. This will be discussed and mutually agreed to between the supplier and purchaser before placement of order. The standards and normal according to which these tests are to be carried out are listed against each test. Where a particular test is a specific requirement of this specification, the norms and procedure for the same shall be as mutually agreed between the supplier and the purchaser in the quality assurance programme.

#### **TYPE, ROUTINE & ACCEPTANCE TESTS:**

The following type test shall be conducted on a suitable number of individual unit components, materials or complete strings.

##### **1. On complete insulator string with hardware fittings Standards BS:137(Part-I) IEC: 383**

- a) Power frequency voltage withstand test with corona control rings and under wet condition.
- b) Impulse voltage withstand test under dry condition.
- c) Mechanical strength test. As per this specification.

##### **2. On Insulators:**

- a) Verification of dimensions. :IS: 731
- b) Thermal mechanical performance test: : IEC:575
- c) Power frequency voltage withstand and flashover
  - i) dry ii) wet :BS:173
- d) Impulse voltage withstand flashover test (dry) : IEC: 383
- e) Visible discharge test (dry) : IS:731



All the type tests given under clause No.5.14 above shall be conducted on single suspension and Double Tension insulator string along with hardware fittings.

**3. ACCEPTANCE TESTS: For insulator:**

- a) Visual examination : IS:731
- b) Verification of dimensions. : IS:731
- c) Temperature cycle test. : IS:731
- d) Galvanizing test. : IS:731
- e) Mechanical performance test. : IEC:575
- f) Test on locking device for ball and socket coupling. :IEC-372
- g) Eccentricity test.
- h) Electro-mechanical strength test : As per this specification.
- i) Puncture test. : IS:731
- j) Porosity test. : IS:731

**4. ROUTINE TESTS: For insulators:**

- a) Visual inspection. : IS:731
- b) Mechanical routine test.
- c) Electrical routine test. : IEC:383

**ADDITIONAL TESTS:**

The purchaser reserves the right for carrying out any other tests of a reasonable nature at the works of the supplier/ laboratory or at any other recognized laboratory/ research institute in addition to the above mentioned type, acceptance and routine tests at the cost of the purchaser to satisfy that the material complies with the intent of this specification.

**CO-ORDINATION FOR TESTING:**

For insulator strings, the supplier shall arrange to conduct testing of their disc insulators with the hardware fittings to be supplied to the purchaser by other suppliers. The supplier is also required to guarantee overall satisfactory performance of the disc insulator with the hardware fittings.

**NOTE:**

In respect of electrical tests on a complete string consisting of insulators and hardware guarantee of values of responsibility of testing shall be with hardware manufacturer of RIV corona and voltage distribution test and with insulator manufacturer for all other tests.

**TEST CHARGES AND TEST SCHEDULE:**

**TYPE TEST:**

The insulator offered shall be fully type tested as per this specification. In case the equipment of the

type and design offered, has already been type tested in an independent 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. The purchaser reserves the right to demand repetition of some or all type tests in the presence of purchasers' carrying representative. For this purpose the bidder may quote unit rates for carrying out each type test. These prices shall be taken into consideration for bid evaluation. For any change in the design/type already type tested and the design/type offered against this specification, purchaser reserves the right to demand repetition of tests without any extra cost.

#### **ACCEPTANCE AND ROUTINE TEST:**

All acceptance and routine tests as stipulated herein shall be carried out by the supplier in the presence of purchaser's representative.

Immediately after finalization of the programme of type/ acceptance/ routine testing, the supplier shall give sufficient advance intimation to the purchaser to enable him to depute his representative for witnessing the tests.

For type tests involving tests on a complete insulator string with hardware fittings, the purchaser will advise the supplier of the hardware fittings to provide the necessary fittings to the place of the test.

In case of failure of the complete string in any type tests, the supplier whose product has failed in the tests shall get the tests repeated at his cost. In case of any dispute, assessment of the purchaser as to the items that has caused the failure in any of the type tests shall be final and binding.

#### **VOLTAGE DISTRIBUTION TEST:**

- a) The voltage across each insulator unit shall be measured by sphere gap method. The result obtained shall be converted into percentage and proportionate correction be applied as to give a total of 100% distribution.
- b) The complete insulator string along with its hardware fitting excluding arcing horn corona controlling/grading ring and suspension assembly/dead end assembly shall be subject to a load equal to 50% of the specified minimum ultimate tensile strength (UTS) which shall be increased already rate to 68% of the minimum UTS specified. The load shall be held for five minutes and then removed. After removal of the load, the string components shall not show any visual deformation and it shall be possible to disassemble them by hand,. Hand tools may be used to remove cotter pins and loosen the nuts initially. The string shall then be reassembled and loaded to 50% of UTS and the load shall be further increased at a steady rate till the specified minimum UTS and held for one minute. No fracture should occur during this period. The applied load shall then be increased until the failing loads reached and the value recorded.

#### **VIBRATION TEST:**

The suspension string shall be tested in suspension mode, and tension string in tension mode

itself in laboratory span of minimum 30 meters. In the case of suspensions string a load equal to

600 Kg. shall be applied along with the axis of the suspensions string by means of turn buckle. The insulators string along with hardware fittings and two sub conductors throughout the duration of the test vibration dampers shall not be used on the test span. Both the sub- conductors shall be vertically vibrated simultaneously at one of the resonance frequencies of the insulator string (more than 10Hz) by means of vibration inducing equipment. The amplitude of vibration at the antipode point nearest to the string shall be measured and the same shall not be less than 120.4 being the frequency of

vibration. The insulator strings shall be vibrated for five million cycles then rotated by 90 deg and again vibrated for 5 million cycles without any failure, after the test, the disc insulators shall be examined for looseness of pins and cap or any crack in the cement. The hardware fittings shall be examined to fatigue fatter and mechanical strength test. There shall be no deterioration of properties of hardware components and disc insulators after the vibration test. The disc insulators shall be subjected to the following tests as per relevant standards.

Test.	Percentage of disc to be tested
a)Temperature cycle test followed by Mechanical performance test.	60
b)Puncture test (for porcelain insulator only)	40

**INSPECTION:**

- i. Purchaser and its representative shall at all times be entitled to have access to the works and to all places of manufacturer where insulators are manufactured and the supplier shall afford all facilities to them for unrestricted inspection of the works, inspection of materials, inspection of manufacturing process of insulators and for conducting necessary tests as specified herein.
- ii. The supplier shall keep the purchaser informed in advance of the time of starting and of progress of manufacture of insulators 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 materials has been satisfactorily inspected and tested.
- iv. The acceptance of any quantity of insulators shall in no way relieve the supplier of his responsibility for meeting all the requirement of this specification and shall not prevent subsequent rejection, if such insulators are later found to be defective.

**IDENTIFICATION MARKING:**

- a) Each unit of insulator shall be legibly and indelibly marked with the trade mark of the supplier, the year of manufacture, the guaranteed combined mechanical and electrical strength in kilo-Newton abbreviated by ‘\_KN’ to facilitate easy identification and proper use.
- b) The marking shall be on porcelain for porcelain insulators. The marking shall be printed and not impressed and the same shall be applied before firing.

**QUALITY ASSURANCE PLAN:**

The bidder here under shall invariably furnish following information along with his offer, failing which the offer shall be liable for rejection.

- a. Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw material are tested, list of tests normally carried out on raw materials in presence of bidder’s representative, copies of test certificates.

- b. Information and copies of test certificates as in (i) above in respect of bought out materials.
- c. List of manufacturing facilities available.
- d. Level of automation achieved and lists of area where manual processing exists.
- e. List of areas in manufacturing process, where stage inspections are normally carried out in quality control and details of such tests and inspection.
- f. Special features provided in the equipment to make it maintenance free.
- g. List of testing equipping available with the bidder 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 in schedule of deviations from specified test requirements.

The supplier shall within 15 days of placement of order submit the following information to the owner.

List of raw material and the names of sub-suppliers selected from those furnished along with the offer.

#### **CHEMICAL ANALYSIS OF ZINC USED FOR GALVANIZING.**

Samples taken from the zinc ingot shall be chemically analyzed as per IS: 209. The purity of zinc shall not be less than 99.95%.

#### **TESTS FOR FORGINGS:**

The chemical analysis hardness tests and magnetic particle inspection for forgings will be as per the internationally recognized procedures for these tests. The sampling will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the supplier and purchaser in quality assurance programme.

#### **TESTS ON CASTING:**

The chemical analysis mechanical and metallographic tests and magnetic particle inspection for castings will be as per the internationally recognized procedures for these tests. The samplings will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the supplier and purchaser in quality assurance programme.

#### **HYDRAULIC INTERNAL PRESSURE TEST ON SHELLS:**

The test shall be earned out on 100% shells before assembly. The details regarding test will be as discussed and mutually agreed to by the suppliers and purchaser in Quality Assurance Programme.

#### **THERMAL MECHANICAL PERFORMANCE TEST:**

The thermal mechanical performance test shall be carried out on minimum 15 number of disc insulators units as per the procedure given in IEC 575. The performance of the insulator unit shall be determined by the same standard.

#### **ECCENTRICITY TEST:**

The insulator shall be vertically mounted on a fixture using dummy pin and socket. A vertical scale with horizontal slider shall be used for the axial run out. The pointer shall be positioned in contact with the bottom of the outermost petticoat of the disc. The disc insulators shall be rotated with reference to the fixture and the slider shall be allowed to move up and down on the scale but always maintaining

contact with the bottom of the outer most petticoats. After one full rotation of the disc the maximum and minimum position the slider has reached on the scale can be found out. Difference between the above two readings shall satisfy the guaranteed value for axial run out.

Similarly using a horizontal scale with veridical slider the radial run out shall be measured. The slider shall be positioned on the scale to establish contact with the circumstance of the disc insulator and disc insulator rotated on its future always maintaining the contact. After one full rotation of the disc the maximum and minimum position the slider has reached on the scale can be found out. Difference between the above two readings shall satisfy the guaranteed value for axial run out.

**CRACK DETECTION TEST:**

Crack detection test shall be carried out on each ball and pin before assembly of disc unit. The supplier shall maintain complete record of having conducted such tests on each and every piece of ball pin The bidder shall furnish full details of the equipment available with him for crack test and also indicate the test procedure in detail.

**DISC INSULATOR (B&S) Type:**

Bidder should offer 11KV/33 KV Disc Insulator (B & S type) suitable for overhead power line Conforming to IS:731/1971 (2<sup>nd</sup> Revision), (Amendments - 6), Reaffirmed – 1991 & Guaranteed Technical Particulars. Type test certificates from CPRI or accredited NABL laboratory should be furnished

**GUARANTEED TECHNICAL PARTICULARS**

**DISC INSULATOR B & S TYPE**

Sl. No.	Description	Unit	70KN.	Bidder's Offer
1.	Manufacture's Name & Address		To be specified by bidder	
2.	Type of Insulator		Ball T Socket	
3	Size of Ball & Socket		16B	
4	Dimensions			
a)	Disc Diameter	mm	255	
b)	Unit spacing	mm	145	
c)	Creepage distance of single insulator	mm	430	
5	Electromechanical strength of single insulator	KN	70	
6	Materials of Shell		Porcelain	
7	Dry one minute power frequency	Kv(rms)	80	
6	Wet one minute power frequency	Kv(rms)	45	
7	Dry power frequency flashover.	Kv(rms)	85	
8	Wet power frequency flashover.	Kv(rms)	50	

9	Dry impulse withstand positive & negative.	Kv (Peak)	170	
10	Impulse flashover 1.2 x 50 microsecond (Positive)	Kv(Peak)	125	
11	Impulse flashover 1 x 50 microsecond (Negative)	Kv(Peak)	125	
12	Power frequency puncture voltage	Kv	1.3 times the actual drive flashover voltage of the unit.	
13	High system voltage.	Kv	36	
14	Visible Discharge voltage.	Kv	27	
15	Weight/Unit.	Kg.	To be specified by bidder	
16	Marking :--	Each insulator will be legibly marked to show the following :		
		(a) Name of the Purchaser :-- NESCO		
		(b) Name or trademark :--		
		(c) Month & year of manufacturing :-- -		
		(d) Minimum failing load.		
	PACKING: -- All insulators shall be packed suitably for easy but rough handling & acceptable for road transport. Where more than one insulator is packed in a crate, separator shall be fixed between the insulators to keep individual insulator in position without movement in the crate.			

**NB- Every insulator should bear the marking of manufacturer's name & Purchaser's name and ISI mark.**

**Name & Signature of Bidder with seal**

**11 KV STAY INSULATOR:**

**LT STAY INSULATOR:**

**TECHNICAL SPECIFICATION OF LT & HT GUY STRAIN INSULATORS (STAY INSULATORS)**

**1. SCOPE:**

The specification covers porcelain guy strain insulators for use in LT & HT distribution system.

**2. APPLICABLE STANDARDS:**

Except when they conflict with the specific requirements of this specification, the insulators shall comply with IS: 5300-1969 or the latest version thereof.

**3. GENERAL REQUIREMENTS:**

The porcelain shall be sound, free from defects, thoroughly vitrified and smoothly glazed. The design of the insulators shall be such that the stresses due to expansion and contraction in any part of the insulator shall not lead to its deterioration. The glaze shall be brown in color for insulators. The glaze shall cover the entire porcelain surface parts except those areas that serve as supports during firing.

<b>4. SYSTEM CONDITIONS:</b>	<b>LT</b>	<b>HT</b>
Frequency	: 50 Hz	50 Hz
Nominal System Voltage	: 400/230 V	11 KV
Maximum System Voltage LT System	: 440/250 V	12KV
Minimum LT Voltage	: 370 V	11 KV
Power frequency one minute withstand (Dry)	: 18 KV	27KV
Power frequency one minute withstand (Dry)	: 8 KV	13KV
Neutral Earthing arrangement LT System	: Solidly Earthed	Solidly Earthed

**5. TYPE OF INSULATORS:**

The standard guy strain insulators shall be of designation „A“ and „C“ as per IS: 5300/1969 or its latest revision. The recommended type of guy strain insulators for use on guy wires of LT overhead lines are Type-A & 11KV overhead line are Type-C

**6. TESTS:**

**a. Type tests:**

- a) Visual examination
- b) Verification of dimensions
- c) Temperature cycle test
- d) Dry one minute power frequency withstand test
- e) Wet one minute power frequency withstand test
- f) Mechanical strength test

g) Porosity test

**6.2 Acceptance test:**

The insulators, after having withstood the routine test shall be subjected to the following acceptance tests in the order given below:

- a) Verification of Dimensions.
- b) Temperature cycle test
- c) Mechanical strength test
- d) Porosity test

**6.3 Routine tests:**

- i) Visual examination

**7. TESTING FACILITIES:**

a. The Bidder must clearly indicate what testing facilities are available in the works of the manufacturer and whether the facilities, are adequate to carry out all the routine as well as type tests. These facilities should be made available to Purchaser's Engineers if deputed to carry out or witness the tests. If any tests cannot be carried out at the manufacturer's works, the reasons should be clearly stated in the tender.

b. The Bidder shall furnish detailed type test reports of the offered L.T. & HT Stay Insulators as per clause 6.1 of this specification. All the above 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 the insulators offered meet the requirements of the specification. These Type Tests should have been carried out within five years prior to the date of opening of this tender.

c. The offered L.T. & HT Stay Insulators are already fully Type Tested at Laboratories accredited by the National Accreditation Board of Testing and Calibration Laboratories (NABL) within five years prior to the date of opening of the tender. There is no change in the design of Type tested L.T. Stay Insulators and those offers against this tender.

**8. Drawings :**

The tender shall be accompanied with the detailed drawings showing the dimensions of the individual insulator, giving all the design dimensions of various component parts. Generally it



shall be as per IS.

**9. MARKING:**

a. Each insulator shall be legibly and indelibly marked to show the following:

- i) Name of the Purchaser : 'NESCO'
- ii) Name or trade mark of the manufacturer
- iii) Year of manufacturer
- iv) ISI certificate, mark, if any.

b. Marking on porcelain shall be applied before firing.

**10. Packing :**

All insulators shall be packed in crates or boxes suitable for rough handling. Packing shall be marked with the strength and voltage rating.

**GUARANTEED TECHNICAL PARTICULARS FOR LT GUY STRAIN  
INSULATOR (TYPE A)**

Sl. No.	Particulars	Requirement	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: 5300-1969 or the latest version thereof	
4	Nominal System Voltage	400/230 V	
5	Highest System voltage	440/250 V	
6	Length	90 mm	
7	Diameter	65 mm	
8	Cable hole diameter	16 ± 1.5	

9	1min. power frequency withstand Voltage (Dry)	18 KV (rms)	
10	1min. power frequency withstand Voltage (Wet)	8 KV	
11	Minimum failing load	44 KN	
12	Minimum creepage distance	41 mm	
13	Drawing	To be submitted by bidder	
14	Conforming standard	As per IS	

**NB- Every insulator should bear the marking of manufacturer's name & Purchaser's name and ISI mark**

**Name & Signature of Bidder with seal**

**GUARANTEED TECHNICAL PARTICULARS FOR 11 KV GUY  
STRAIN INSULATOR (TYPE C)**

<b>Sl. No.</b>	<b>Particulars</b>	<b>Requirement</b>	<b>Bidder's offer</b>
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: 5300-1969 or the latest version thereof	
4	Nominal System Voltage	11 KV	
5	Highest System voltage	12 KV	
6	Length	140 mm	
7	Diameter	85mm	
8	Cable hole diameter	25 ± 1.5	
9	1min. power frequency withstand Voltage (Dry)	27 KV (rms)	

10	1min. power frequency withstand Voltage (Wet)	13 KV	
11	Minimum failing load	88 KN	
12	Minimum creepage distance	57 mm	
13	Drawing	To be submitted by bidder	
14	Conforming standard	As per IS	

**NB- Every insulator should bear the marking of manufacturer’s name & Purchaser’s name and ISI mark.**

**Name & Signature of Bidder with seal**

## **11KV (LIGHTNING ARRESTERS)**

### **TECHNICAL SPECIFICATION FOR 12 KV 10 KA DISTRIBUTION 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. Four (4) 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 shade(deg.C).                 | (-) 5 °C Temperature in |
| 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 <sup>2</sup>   |
| 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 12 KV Distribution 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 1 second 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. =	$12 \times \frac{\sqrt{2}KV \text{ peak}}{\sqrt{3}}$

#### 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**

<b>S. No.</b>	<b>Particulars</b>	<b>Requirement of parameters</b>	<b>Bidder's offer</b>
1	Name of Manufacturer. & Address	To be specified by	
2	Location of type testing	To be specified by	
3	Applicable standard	IS:3070 (Part-III) or the latest version thereof	
4	Rated arrester voltage (KV)	11	
5	Maximum continuous operating voltage (MCOV) KV (rms)	12	
6	Installation	Outdoor	
7	Class	<b>Distribution Class</b>	
8	Type of construction	Single column, single phase	
9	Nominal discharge current corresponding to 8 / 20 micro second wave shape (KA peak)	10	
10	Type of mounting	Pedestal	
11	Connection (between phase to earth) / (between phase to phase)	Phase to Earth	
12	Line discharge class	2	
13	Ratio of switching impulse residual voltage to rated voltage of arrester	As per provision of IEC – 99 – 4 (latest amended)	
14	Minimum prospective symmetrical fault current for pressure relief test (KA rms)	40	
15	Terminal connector suitable for the conductor	Up to 100 mm <sup>2</sup> single	
a)	Take off	For both vertical & horizontal	
b)			
16	Voltage (corona extinction) (KV rms)	Rated voltage of arrester	
17	Partial discharge	As per provision of IEC – 99 – 4 (latest amended)	
18	Whether insulating base and discharge counter with milli ammeter are required	No	

19	Minimum creepage distance of arrester housing	300 mm	
20	Drawing	To be submitted by bidder	

**Name & Signature of Bidder with seal**

