

SECTION - VI
TECHNICAL SPECIFICATION

**TANGEDCO NEW 11 KV STANDALONE STRUCTURE MATERIALS COMPLETE
PACKAGE KIT, MATERIAL LIST**

S.N o.	Name of Product	Quantity
1)	11 KV Vertical Type AB (GOS) Switch Complete Set	1 Set
2)	11 KV Solid Core Type HG Fuse Set	1 Set
3)	Transformer mounting Structure materials with Clamp	1 Set
4)	11 KV Pin Insulators Polymer Composite Type	3 nos
5)	11 KV 45 KN Disc Insulators Polymer Composite Type	3 nos
6)	Disc Insulator Hardware fittings	3 nos
7)	9 KV 5 KA Lightening Arresters Polymer Composite Type	3 nos
8)	GI Tapping channel Cross Arm, HT TI Fittings with Back Clamp	1 Set
9)	GI Stay Set with Stay Clamp & HT Guy Insulator	1 Set
10)	GI Earth Wire 8 SWG	5 Kg
11)	GI Stay Wire 7 / 11	10 Kg
12)	LT Protection Kit with LT Pin Insulators & GI Pin	1 Set
13)	GI Earth Pipe - 2 M Length	3 nos
14)	Danger Board - SMC	1 nos
15)	Transformer Safety Boot with Conductor Sleeves	1 Set
16)	Bolts & Nuts (Lump Sum)	1 Set

SECTION - VI

A. TECHNICAL SPECIFICATION FOR VERTICALLY OPERATED 11 KV GANG OPERATED AIR BREAKER SWITCH WITH COMPOSITE POLYMER INSULATORS FOR HVDS

SCOPE:

This specification covers the design, manufacture, testing before dispatch and delivery at destination of 11 KV vertically mounted and Gang Operated Air Breaker (GOAB) switch 200 Amps as detailed below:

The AB Switch is of continuous rating, outdoor, vertically mounted, gang operated, single break for 200 Amps capacity for use on 11 KV 50 cycles three phase system. It is operable with **square tandem Rod** for movement. The Insulators used shall be Post Type Composite Polymer Insulator 3 nos. per phase with arcing horns.

The switch shall be complete with accessories such as base channel, phase channels, supporting MS channels, post type composite polymer insulators, tandem pipe, operating pipe, operating handle, connecting pipe guides and locking arrangement etc.,

DESIGN:

The AB Switch shall be suitable for mounting on a single pole Distribution Transformer structure vertically.

- 2.2. The switch shall be mounted at about 6 Mtr above ground level and shall be capable of operating by the handle from ground level by means of a vertically operable operating handle.

The TANDEM shall consist of square tandem Rod of length 1125 mm. The vertical GI pipe of 25 mm inner diameter, class B, thickness 3.2mm, 5645 mm length in single piece without joint. The mechanism should give good mechanical leverage with minimum of loose/lost motions. The GI pipe shall conform to IS 1239-part-I-2004 and amendment thereof.

A guide shall be provided to the vertical operating pipe at an intermediate position to arrest its lateral movement. Necessary fixing arrangement of the guide to the pole should also be supplied.

The operating handle shall be suitable to operate the vertically mounted

GOS. The operating mechanism shall be so designed that all the 3 phases are opened or closed simultaneously.

Suitable-locking arrangements shall be provided for the operating handle in both ON and OFF position. The vertical pipe shall be associated with an operating handle in such a way that proper operation of the switch with up and down movement of the vertical pipe is ensured with adequate leverage. The vertically moving insulators shall be fixed on the tandem pipe.

The base channel shall be made of robust rolled MS channel section of size 75x40x5 mm.

The phase channel, base channel, MS support channel shall be hot dip galvanized. All ferrous parts in switch shall be zinc electroplated and contacts shall be of copper with tin electroplated. The phase channel shall be fastened to the base channel.

The switch shall be supplied with hot dip galvanized arcing horns of 8 mm dia so that while closing or opening the switches, arcing takes place between the arcing horns and not between the main contacts. earthing terminal for the switch shall be provided.

Current density to be adopted for all parts of AB Switches and terminal connectors shall be, Copper: 2 Amp. / sq.mm and Aluminum Alloy : 1.25Amp./sq.mm.

STANDARDS:

The 11 KV AB Switch shall be capable for withstanding rated mechanical loads and electromagnetic forces, without affecting the operation.

The constructions shall be such that AB Switch will not open to wind pressure, vibrations and reasonable shocks and under the influence of short circuit current.

The AB Switch shall comply with IS.9920 (Part I, II, III & IV)(or) IEC62271-103:2011 with subsequent amendments thereof.

The GI pipe shall comply with IS.1239 part I of 1979 with subsequent amendments thereof.

The Composite Polymer Insulators shall be post type 3 nos. per phase and conform to IEC: 62231 with subsequent amendments thereof. The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed as

follows in line with IEC 62231 with subsequent amendments thereof.

The blades and contacts shall be of best quality electrolytic copper and shall be capable of carrying the rated current without exceeding the temperature limits specified and in the relevant IS.

The contacts are electroplated with tin and shall conform to IS: 1359:1992 with subsequent amendments thereof.

The base channel, phase channel, MS Support channel, Tandem pipe, operating handle shall be hot dip galvanized as per relevant IS with subsequent amendments thereof.

Aluminum Alloy Terminal Connector with bimetallic strips (as per the drawing provided) of good quality and adequate contact area to suit the rating of the switch shall be provided for terminating ACSR conductor, 2 nos. per phase (1 no at fixed contact side and 1 no at moving contact side).

Arc horns shall be of the renewable rod type with make before and break after, features. They shall be robust made with min 8 mm dia G.I rods rigidly fixed. The phase to phase clearance shall be 450 mm minimum. The centre spacing between outertwo post type insulators of the same phase 650mm minimum.

**4.0 RATED VALUES AND CHARACTERISTICS OF 11 KV
VERTICALLY MOUNTED DGO AB SWITCH WITH
COMPOSITE POLYMER INSULATOR**

S.N	Description	Technical Details
1	No of poles	3 (Three)
2	Class	Outdoor
3	Rated voltage (Nominal)/ Rated Voltage of AB	11 KV/ 12 KV
4	Rated insulation level impulse withstand voltage	
4.1	To earth between poles	75 KV (Peak)
4.2	Across the isolating distance	85 KV (Peak)
5	Rating one minute power frequency withstand voltage	
5.1	To earth between poles	28 KV (RMS)
5.2	Across the isolating distance	32 KV (RMS)
6	Rated frequency	50 c/s
7	Rated normal current	200 Amps
8	Rated short time withstand current	Minimum 16 KA
9	The standard value of rated duration of short	1 sec
10	Rated peak short circuit withstand current	Minimum 40 KA
11	Composite Polymer Insulators	
11.1	Type	Post Type
11.2	No of units per pole	Post Type: 3 nos
11.3	Dry/Wet power frequency withstand voltage	70/45 (KV rms)
11.4	Lighting Impulse withstand voltage	130 (KVp)
11.5	Mechanical Load (Bending)	5 KN
11.6	Radio Interference Voltage Test	< 100µV
11.7	Water Diffusion Test	<1mA (r.m.s)
11.8	Creepage Distance	320 mm Min.
11.90	Diameter of FRP Rod	24 mm
11.10	Diameter of weather sheds	110 mm
The maximum temperature attained by any part of the equipment when in service at site under continuous full load conditions and exposed to the direct rays of sun shall not		

5.0 TYPE TEST:

The Type Test certificates covering all the tests as per IS.9920 (Part I to IV) or IEC62271- 103:2011 with subsequent amendments thereof, obtained from a Government recognized testing laboratory should be enclosed in the Tender offer by the Tenderers. The details of Type Test should also be furnished in Schedule prescribed. The Type Test conducted shall not be earlier than Five years and valid on the date of tender opening.

The purchaser reserves the right to demand repetition of some or all the type tests in the presence of purchaser's representative at no extra cost. For any change in the design/type, already type tested and the design/type offered against this specification the purchaser reserves the right to demand, repetition of tests without any extra cost.

6.0 ROUTINE TESTS:

All routines tests as specified in IS.9920 (Part – I to IV) or IEC62271-103:2011 of the latest issue shall be carried out on each switch and the test results shall be furnished for approval. Manufacture's test certificate in respect of all materials as specified in IS.9920 OR IEC62271- 103:2011 of the latest issue and else where in the specification shall be furnished.

In addition to the above tests, the purchaser reserves the right of carrying out at site such tests as he may decide upon. Such additional test shall be carried out at the purchaser's cost. Test certificate furnishing the results of routine tests as per appropriate Indian Standard Specification should be forwarded before dispatching the materials. The materials will be rejected, if the test results are not satisfactory.

The Board reserves the right to have the Acceptance Tests as specified in IS.9920 (Part -I to IV) OR IEC62271-103:2011 with subsequent amendments thereof. The tenderer has to submit the GTP enclosed.

7.0 CONTACTS:

The contacts shall be self aligning high pressure type formed out of rolled/extruded electrolytic copper flat riveted with tinned copper flexible. They shall be aided by powerful springs of steel (suitably shrouded) so as to ensure good contact and help to reduce the voltage drop and losses in contact. The contacts shall conform to IS 5561 -1970 reaffirmed 2002 with subsequent amendments thereof.

Suitable continuous copper connections with a copper flexible from the Aluminium Alloy Terminal Connector with bimetallic strips (as per the drawing provided) of good quality on the fixed contact side to the Aluminium Alloy Terminal Connector with bimetallic strips (as per the drawing provided) of good quality on moving contact side shall be provided. The sectional area of copper flexible jumper will be adequate to carry the rated current of the switch continuously. Suitable levers/bushes to be provided to stop the over travel of the blades during the opening operation.

All the bolts and nuts shall be G.I. They shall be provided with washers and lock nuts wherever required.

8.0 The 11 KV COMPOSITE POLYMER INSULATORS

The post type composite polymer insulators required for 11 KV AB switches, 3 nos per phase should be procured from the ISO Certified firms with valid Type Test certificates as per relevant IEC 62231:2006, IEC61109 Edition 2 (2008-05) and IEC60437-1997 with subsequent amendments thereof

Necessary documentary evidence for having procured 11 KV post type composite polymer insulators from the above firms shall be produced to the inspection agency during the time of inspection and enclosed along with the test certificates for approval.

Except where modified by the specification, the post type insulators shall comply with the requirement of IEC 62231:2006, IEC 61109 Edition 2 (2008-05) and IEC 60437-1997 with subsequent amendments thereof.

The Insulators shed/housing shall be made of Epoxy/silicone alloy rubber. The insulator core materials shall be made of fiberglass, resin vinylester. The core rod diameter for post type insulator shall be 24 mm. The metal fittings shall be made through forging and method of attachment to core crimp. The insulators shall be grey in colour.

The insulators shall be of the best quality and workmanship. These shall be free from cracks, flaws chips etc. or other imperfections and other defects of manufacture and shall present a compact vitreous appearance in every respect. The design shall be such that stresses due to expansion, contraction shall not lead to the development of defects. They shall be rugged and not susceptible to mechanical breakage.

9.0 FASTENERS:

The fasteners shall be made of malleable cast iron and continuously hot dip galvanized/ electroplated including the studs and washers. The uniformity of zinc coating shall satisfy the requirements of IS.2633/1964 with subsequent amendments thereof. The hardware shall satisfy the requirements given in clause 4.5-4.7 of the IS.2544/1973 with subsequent amendments thereof.

10.0 TOLERANCE:

Plus or Minus 5% tolerance may be allowed for all dimensions indicated in the drawing subject to satisfying other conditions.

11.0 MARKING:

Every switch shall be provided with name plate legibly impressed with the following information:

- a) The maker's name or trademark.
- b) Year of manufacture.
- c) TANGEDCO / PONO.
- d) Rated Voltage, Rated Current, Frequency
- e) Sl.No.
- f)

12.0 LOCK AND KEY:

A standard lock with duplicate keys should be provided with each switch. Suitable arrangement should be provided to lock the operating handle in 'ON' and 'OFF' position.

CLIMATIC CONDITIONS:

The materials are for use in Tamil Nadu and should be satisfactory for operation under tropical conditions in Tamil Nadu.

The ambient temperature will be within the range of -10 degree centigrade to +50 degree centigrade.

The altitude will be less than 2500 meters.

The maximum atmospheric humidity will be in the range of 95%. Average number of thunder storm days per annum is 65.

Average number of dust storm days per annum is 5. Average number of rainy days per annum is 65.

Average annual rainfall is 10.00 cm.

The climatic conditions are prone to wide variation in ambient condition and equipment offered under this specification.

**B. TECHNICAL SPECIFICATION FOR VERTICALLY MOUNTED 11
KV H.G. FUSE UNITSWITH COMPOSITE
POLYMER INSULATORS FORHVDS**

1.0 SCOPE:

This specification covers the manufacture, testing at manufacturer's works and supply of 11 KV vertical type Horn Gap fuse units using Solid Core composite polymer insulators. The fuse units shall conform IS 9385 - 1980 and IEC 60282-2 and to the drawing. The Solid core Composite Polymer Insulators used for manufacturing Horn Gap Fuse units shall confirm to IEC 61109 & to the Drawing. The Type Test reports should be obtained from NABL accredited Laboratories of both Horn Gap Fuse units & Solid core Composite Polymer Insulator & it should be enclosed in the Tender offer.

2.0 ATMOSPHERIC CONDITIONS:

The fuse units are to be installed at places with following weather conditions:

Temperature:

Maximum ambient – 50 deg C

Average 32deg C

Minimum - 5 deg C

The fuse shall generally conform to IS, dealing with high voltage expulsion fuses.

INSULATORS:

The Insulator used shall be of 11 KV composite polymer type, the drawing of which is enclosed. The bidders shall furnish the Type test certificates of the composite polymer Insulators from the recognized laboratories / Research institutes or testing house.

The Insulator shall be composite polymer, grey colour conforming to the drawing herein enclosed with the technical details and shall be suitable for highest system voltage of 12 KV. The insulator shall be in one piece. The stresses due to expansion and contraction in any part of the insulators shall not lead to its deterioration.

The Solid Core Composite Polymer Insulator used for Manufacturing HG Fuse units shall confirm to IEC 61109 with latest amendments & to the drawing.

Following tests shall be conducted and test certificate duly signed by a responsible officer of the manufacturer shall be submitted:

- a. Dry power frequency voltage withstand test
- b. Wet power frequency voltage withstand test
- c. Dry power frequency voltage flashover test
- d. Wet power frequency voltage flash over test
- e. High voltage impulse voltage withstand test
- f. High voltage 50% impulse flash over test.
- g. High voltage visible discharge test.
- h. Electro mechanical failing load test.

CONSTRUCTION

All ferrous parts shall be Hot Dip Galvanized as per IS 1573-1986 (Reaffirmed 2006) or IS 4759-1996. The fuse sets are meant for mounting on a structure at a height of 4.5 meters to 5.0 meters from ground level suitable for single pole Distribution Transformer structure of HVDS.

The fuse units shall be suitable for vertical mounting. The mounting shall be by using 25x25x5mm cleat bolted to 25x6mm MS flat of 570mm length fixed to the central portion of the composite polymer insulator. All the MS parts shall be hot dip galvanized as per relevant IS.

The composite part shall be permanently secured at the centre in a metal support to be mounted on the supporting structure. They shall be made up of interchangeable units and shall be capable of being mounted on the supporting structures. Suitable GI bolts, washers required shall also be supplied with the insulators. The portion of the central metallic support where it is bolted to the composite polymer insulator should be insulated to that level of the insulators to avoid bird faults.

The composite polymer shall be sound and homogenous, free from defects, laminations and other flaws of imperfections which might affect the mechanical or dielectric strength. These should be thoroughly tough, impervious to moisture and smoothly surface finish.

The composite polymer and metal parts shall be assembled in such a manner that any thermal expansion differential between the metal and composite parts throughout the range of temperature variation shall not loosen the parts or create undue internal stresses which may affect the electrical or mechanical strength and rigidity. The Insulators shall conform in all respects to IEC 60282-2. All the ferrous metal parts shall be hot dip galvanized in accordance with IS2633 with latest amendments. Nuts and Bolts shall conform to IS1364. Spring Washers shall be electro galvanized. The mounting cleats/flats shall be zinc electroplated.

Arcinghorns:

The fuse units shall be provided with arcinghorns of 8mm diameter hotdip galvanized steel rod.

The other particulars like GI strip, brass wingnuts, GIuats etc., are furnished in the drawing enclosed.

The HG fuse unit shall be designed to withstand the voltage for composite polymer insulators.

Type tests on one of the HG Fuse units as per the provision of the relevant Indian Standards Specifications shall be conducted in recognized laboratory and the Type test certificates along with the drawing attested by the concerned laboratory & should be enclosed in the Tender offer by the Tenderers.

NAMEPLATE

The HG Fuse unit shall be provided with a name plate legibly and indelibly marked with the following information:

1. Name of the material:
2. Name of the manufacturer:
3. TANGEDCO PO No:
4. Type designation and Sl.No.

5. Rated Voltage & Rated current
6. IS specification No. if any.

CLIMATIC CONDITIONS:

The materials are for use in Tamil Nadu and should be satisfactory for operation under tropical conditions in Tamil Nadu.

- a) The ambient temperature will be within the range of +10 degree centigrade to +50 degree centigrade.
- b) The altitude will be less than 2500 meters.
- c) The max. atmospheric humidity will be in the range of 95%.
- d) Average number of thunders tormdays per annum is 65.
- e) Average number of duststorm days per annum is 5.
- f) Average number of rainy days per annum is 65.
- g) Average annual rainfall is 10.00cm.
- h) The climatic conditions are prone to wide variation in ambient condition and equipments
- i) Material offered under this specification shall be suitable for installation at any of the sub- stations in Tamil Nadu.

INSPECTION:

The suppliers shall afford facilities to the Boards representative to inspect their works during the process of manufacture of insulators and also for testing.

- i) The purchaser shall have access at all times to the works and all other places of manufacture, where the materials are being manufactured, and the supplier shall provide to the purchaser's representative all facilities for unrestricted inspection of the works, raw materials, manufacture of all the accessories and for conducting necessary tests as detailed herein.
- ii) The supplier shall keep the purchaser informed in advance of the time of starting and of the progress of manufacture of equipment in its various stages so that arrangements could be made for inspection

- iii) No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected and tested
- iv) The acceptance of any quantity of the equipment 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 equipment are later found to be defective.
- v) Documents like invoices and receipted challans, detailing the source of supply of raw materials and their specification shall be shown by the Supplier on demand, either during manufacturing process or at the time of inspection from the Board.

8.0. TESTS AT SITE:

The purchaser reserves the right of having such test as he may decide upon, being carried out at site at his own expenses to satisfy himself that the materials have not suffered any damage during transit.

Random samples of materials supplied will be tested departmentally, or through approved Government laboratory, if required at purchaser's cost, if required and for any non-conformity to relevant I.S.S. full supplies will be rejected. If the initial payment had already been made, the balance payment will be forfeited and any other losses or damages will also be claimed. Further supplies in such cases will be accepted and paid for only after satisfactory results of the testing of samples. In addition, the guarantee period will also be extended for subsequent supplies at the discretion of the purchaser.

9.0. COMPLETENESS OF TENDER:

The tender should be complete with all details of illustrative and descriptive literature and drawings. The tenderers shall furnish the complete technical. Details of the equipment's. Information regarding the country of manufacturer origin of materials used in the manufacture of the articles should be

furnished. The tenderer should include all minor accessories even though not specifically mentioned in this specification but which are essential for the completeness of the materials ordered. The tenderer shall not be eligible for any extra charges in respect of such minor accessories though not included in the tender.

10.0. INTERCHANGEABILITY:

All similar parts and removable parts of similar items shall be interchangeable with each other.

MATERIALS AND WORKMANSHIP:

All materials shall be new, unused and originally coming from manufacturer's plant to the destination stores. Those including used, rebuilt or overhauled materials will not be accepted.

All the materials shall be of best class and capable of satisfactory operation in the tropics with humid atmospheric condition.

The design shall incorporate every reasonable precautions and provisions for the safety of all those concerned in the operation and maintenance of equipment.

TYPE TEST:

The Type Test certificates covering all the tests as per IS 9385 - 1980 and IEC 60282-2 and to the drawing. The Solid core Composite Polymer Insulators used for manufacturing Horn Gap Fuse units shall confirm to IEC 61109 & to the Drawing., obtained from a Government recognized NABL testing laboratory should be enclosed in the Tender offer by the Tenderers. The details of Type Test should also be furnished in Schedule prescribed. The Type Test conducted shall not be earlier than Five years and valid on the date of tender opening.

The purchaser reserves the right to demand repetition of some or all the type tests in the presence of purchaser's representative at no extra cost. For any change in the design/type, already type tested and the design/type offered against this specification the purchaser reserves the right to demand, repetition of tests without any extra cost.

**C. TECHNICAL SPECIFICATION FOR SINGLEPOLE
TRANSFORMER STRUCTURE MATERIAL
WITH CLAMP FOR HVDS**

- (i) Supply of Structure Clamps (Hot dip galvanized) for Distribution Transformer specially made out of 50X8 mm MS flats suitable for 9.00 Mtr 150 Kg WL RCC Square section poles as per drawing enclosed.
- (ii) Supply of Mounting Channels, seating channels and support angles for Distribution Transformer structure shall be made of robust rolled MS channel, MS Angles hotdip galvanized as per the drawing enclosed.
- (iii) Dimensions for MS Channels, MS Angles, MS flats and Clamps shall be in accordance with drawing enclosed and all ferrous parts shall be **hot dip galvanized as per relevant IS. The Type Test certificates of Transformer Structure materials shall be enclosed in the Tender offer by the bidder. The Type Test should have been conducted within 5 YEARS as on date of the Tender opening.**

INSPECTION:

- i) The purchaser shall have access at all times to the works and all other places of manufacture, where the materials are being manufactured, and the supplier shall provide to the purchaser's representative all facilities for unrestricted inspection of the works, raw materials, manufacture of all the accessories and for conducting necessary tests as detailed herein.
- ii) The supplier shall keep the purchaser informed in advance of the time of starting and of the progress of manufacture of equipment in its various stages so that arrangements could be made for inspection
- iii) No material shall be dispatched from its point of

manufacture unless the material has been satisfactorily inspected and tested.

- iv) The acceptance of any quantity of the equipment 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 equipment are later found to be defective.
- v) Documents like invoices and receipted challans, detailing the source of supply of raw materials and their specification shall be shown by the Supplier on demand, either during manufacturing process or at the time of inspection from the Board.

3.0. TESTS AT SITE:

The purchaser reserves the right of having such test as he may decide upon, being carried out at site at his own expenses to satisfy himself that the materials have not suffered any damage during transit.

Random samples of materials supplied will be tested departmentally, or through approved Government laboratory, if required at purchaser's cost, if required and for any non-conformity to relevant I.S.S. full supplies will be rejected. If the initial payment had already been made, the balance payment will be forfeited and any other losses or damages will also be claimed. Further supplies in such cases will be accepted and paid for only after satisfactory results of the testing of samples. In addition, the guarantee period will also be extended for subsequent supplies at The discretion of the purchaser.

4.0. COMPLETENESS OF TENDER:

The tender should be complete with all details of illustrative and descriptive literature and drawings. The tenderers shall furnish the complete technical.

Details of the equipment's. Information regarding the country of manufacturer origin of materials used in the

manufacture of the articles should be furnished. The tenderer should include all minor accessories even though not specifically mentioned in this specification but which are essential for the completeness of the materials ordered. The tenderer shall not be eligible for any extra charges in respect of such minor accessories though not included in the tender.

5.0. INTERCHANGEABILITY:

All similar parts and removable parts of similar items shall be interchangeable with each other.

MATERIALS AND WORKMANSHIP:

All materials shall be new, unused and originally coming from manufacturer's plant to the destination stores. Those including used, rebuilt or overhauled materials will not be accepted.

All the materials shall be of best class and capable of satisfactory operation in the tropics with humid atmospheric condition.

The design shall incorporate every reasonable precautions and provisions for the safety of all those concerned in the operation and maintenance of equipment.

TYPE TEST:

The Type Test certificates covering all the tests for Transformer Structure materials with subsequent amendments thereof obtained from a Government recognized NABL testing laboratory should be enclosed in the Tender offer by the Tenderers. The details of Type Test should also be furnished in Schedule prescribed. The Type Test conducted shall not be earlier than 5 years and valid on the date of tender opening.

The purchaser reserves the right to demand repetition of some or all the type tests in the presence of purchaser's representative at no extra cost. For any change in the design/type, already type tested and the design/type offered against this specification the purchaser reserves the right to demand, repetition of tests without any extra cost.

SCHEDULE - I

Schedule of Guaranteed Technical Particulars for Vertically operated 11 KV gang operated Air breaker switches with Post Type Composite Polymer Insulators

S.N	Technical Particulars	Requirement
1	Maker's Name and Address	Maker's Name and
2	Type of Switch	Single Break
3	Type of Mounting	Vertical
4	No of Poles	3
5	Frequency	50 Hz
6	Voltage Rating	11 KV
7	Current rating in Amp	200 Amp
8	Temperature Rise: The Temperature should not exceed the maximum limit as specified at a temperature not	
	Copper contact with coatings	50 deg C
	Terminals of switches intended to be bolted to the external	65 deg C
	Metallic parts acting as springs	50 deg C
9	Electroplating of the contacts	Zinc / Tin
10	Thickness of the plating	Minimum 10 µm
11	Short – time current and duration	Minimum 16 KA for 1seconds, 40 KA Peak
12	Materials of fixed contact	Electrolytic hard drawn copper
13	Materials of Moving contact	Electrolytic hard drawn copper
14	Material of terminal connector	Aluminum casting With Bimetallic Strip
15	Type, Diameter and Length of Operating handle	Class B, GI pipe of 25 mm NB, Length:5645mm
16	Material of arcing horns	Hot Dip Galvanized
17	Whether dimensional	Tenderer

	drawing is enclosed	Drawing to be enclosed
18	Minimum clearance between phases (The centre distance between the insulators of adjacent phases in the	450 mm
19	Vertical clearance from top of insulator cap to mounting	254 mm
20	Clearance between the edges of fixed and moving contacts (Switch Open position)	330 mm Min.
21	Locking Arrangement	Lockable in Both Position "ON" and "OFF"
22	Particulars of the Switch Rated insulation level impulse withstand voltage	
A	Across the isolating distance	85 KV (Peak)
B	To earth & between the poles	75 KV (Peak)
	Rating one minute power frequency withstand voltage	
C	To earth between poles	28 KV (RMS)
D	Across the isolating distance	32 KV (RMS)
E	Type and Number of Composite Polymer Insulators/ phase	11KV Post type-3 nos.
F	Name of manufacturer of	
G	Height of the insulators	254 mm as per Drawing
H	Diameter of the fibre glass rod	24 mm
23	Electrical Characteristic of Insulators	
A	i) Nominal system voltage	11 KV
	ii) Highest system voltage	12 KV
B	Dry/wet power frequency with stand voltage	70/45 KV
C	Impulse withstand voltage for +ve &	130 KV
D	No of Polymer Sheds for Post Type	3

E	Diameter of the Polymer Sheds for	110 mm
24	Mechanical characteristic	
A	Cantilever test	5 KN
25	General Characteristic	
A	Minimum creepage distance	320 mm Min.
B	Approximate Weight of the complete switch	To be specified by the bidder

SCHEDULE - J

Bill of materials for vertically operated 11 KV gang operated Air Breaker switches

S. No	Description for AB Switch	Dimension, in mm	Quantity
1	11 KV Post-Type composite polymer insulator	As per the standard drawing	9
2	HDG AB Switch Mounting "C" channel	75×40×1000 mm	2
3	HDG Angle and "C" Clamp for operating pipe guide	Angle - ISA 50×50×6 - 500 mm CLamp. - F 50×8 mm	1
4	HDG "C" channel for handle arrangement	75×40×600 mm	1
5	HDG phase channel	75×40×774 mm	3
6	HDG Tandem square Rod	25X25X1125 mm	1
7	GI vertical operating pipe (Class B)	Length: 5645 mm of 25 mm NB and ClassB	1
8	Pentagraph arrangement	As per the drawing provided	3
9	Moving contact arrangement– hard drawn ECgrade copper flat with Flexible Jumper	Copper: 35X6 As per the Drawing provided.	3
10	Fixed contact arrangement - hard drawn ECgrade copper flat	Copper: 35×3 As per theDrawing Provided.	6
11	Fixed contact MS Support	As per the drawings	6
12	Steel spring	As per the drawings	6
13	Tinned copper braided flexible flat rope with endcrimped	As per the drawings	3
14	Aluminium Casting end terminal with bimetallic strip. As per Drawing	As per the drawing provided	3
15	MS arching rod (moving contact side)	As per the drawings	3

16	MS arching rod (fixed contact side)	As per the drawings	3
17	Operating mechanism with lifting handle, guide plate	As per the drawings	1

SCHEDULE K

SCHEDULE OF GUARANTEED TECHNICAL AND PERFORMANCE

PARTICULARS

Guaranteed Technical Particulars for of 11KV Solid Core HG Fuse Set

S.No	Description	Technical Details
	Three phase 11 KV HG Fuse Set	
1	Rated current	200 Amp
2	Rated voltage & highest system voltage	11 KV & 12 KV
3	Temperature rise	Within the limit as specified in the ISS
4	The gap for the fuse wire	200 mm
5	Diameter of horn gap rod	8 mm
6	Rated lightning impulse withstand voltages for positive and negative polarities	
a	To earth and between poles	75 KV (Peak)
b	Across the isolating distance	85 KV (Peak)
7	Rated one minute power frequency withstand voltage (dry and wet) values for the fuse base	
a	To earth and between poles	28 KV (RMS)
b	Across the isolating distance	32 KV (RMS)
	Particulars of Composite Polymer Insulators	
1	Make	Any approved standard Make

2	Type	Solid Core Polymer Composite Insulator
3	Power frequency withstand voltage dry & wet	45 KV (rms)
4	Power frequency Withstand wet	35 KV (rms)
5	Impulse peak withstand voltage	75 KV (rms)
6	Creeping Distance (moderately polluted Atmosphere)	450 mm minimum
7	Minimum current breaking capacity	8 Ka
8	Mechanical Strength	Torsional: 1 kN-m Cantilever: 5 kN
9	Diameter of FRP Rod Thickness of sheath	24 mm 3 mm minimum
10	Diameter of weather sheds & No. of sheds	110 mm & 8 nos

SCHEDULE L

**BILL OF MATERIALS FOR VERTICALLY MOUNTED 11 KV HORN
GAP FUSE UNIT WITH COMPOSITE POLYMER INSULATOR**

S. No.	Description for 11KV HG fuse	Dimension, in mm	Quantity
1	11 KV Solid Core Type Composite Polymer Insulator	As per drawing	3
2	MS Clamp - Hot Dip Galvanized with HDG M10 Nut Bolt	25 X 6 X 570	3
3	PG Clamp with One Groove suitable for 8 mm GI Rod and other groove suitable for 8- 10 mm ACSR Conductor for R Y B	-	6
4	GI horn using 8 mm diameter rod as detail shown through in the drawing with clamping arrangement with 25 X 6 mm flat	8 X 305	6
5	MS Base Channel - Hot Dip Galvanized	75 X 40 X 1000	1

SCHEDULE - M

7. List Of Acceptance Test (To be Carried out at works of Tenderer Before Dispatch of Material).

A. For HG Fuse

1. Visual Inspection
2. Dimensional Confirmation.
3. Dry-Power Frequency voltage withstand Test on Fuse set.
4. Verification of Supplier Test Report For Solid Core Polymer Composite Insulator

List Of Acceptance Test (To be Carried out at works of Tenderer Before Dispatch of Material) For Structure materials :

Dimensional Confirmation

Uniformity of Zinc Coating (CuSo₄ Dip Test as per IS4759)

Mass of Zinc Coating by Elcometer as Per IS4759

Verification of Supplier Test Report Raw material Supplier
(For Steel) Material Should be of Grade E250 A as Per IS 2062 : 2011 (with Latest Amendments)

Verification of Marking on Material

MARKING:

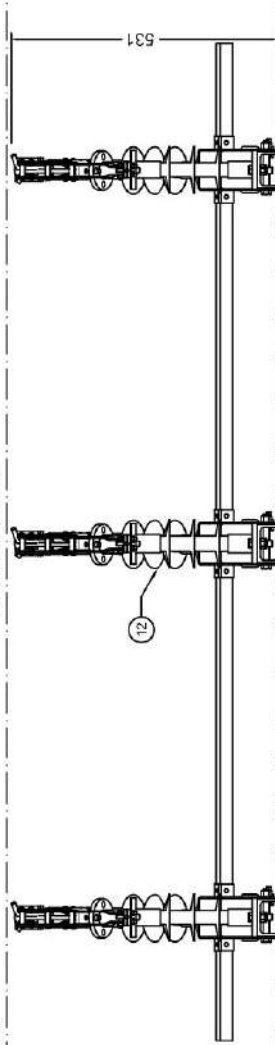
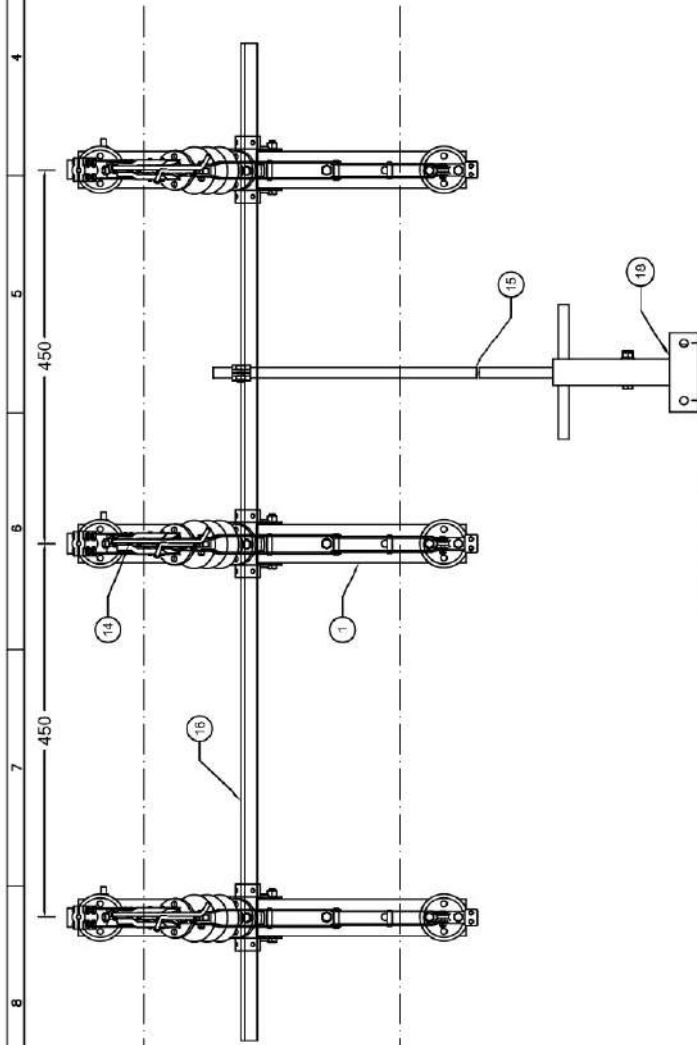
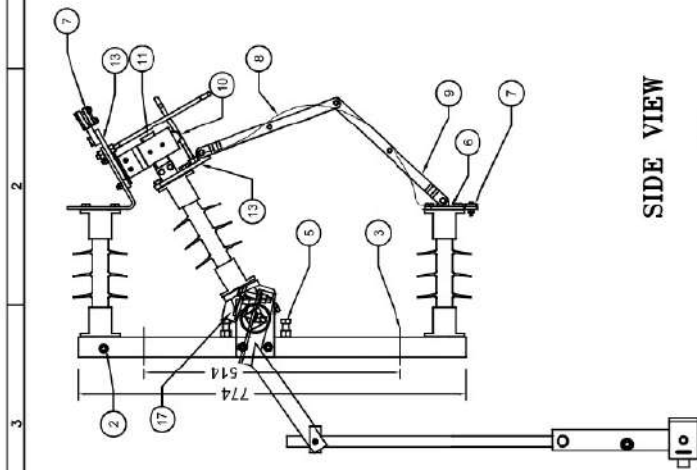
All fabricated items shall be die punched marked (before galvanizing) of supplier having “**Company name, Last Three digit of PO number** by minimum size of **Ariel-16** point font equivalent, and must be clearly visible.

Example: **AB-009**

(where “AB - Company Short Name & 009 Last Three Digit of PO Number) Month & year of manufacturing :MM/Year.

Verification of Minimum Guaranteed Weight.

Minimum weight of complete set of Transformer Structure Material with Clamps finished must be **49.5 Kg**. Weight less than **49.5 Kg** will be rejected.



TECHNICAL PARTICULARS

REF.	REF.	PART NAME	No. REQ	SIZE	MATERIAL	REMARKS	REF.	No. REQ	PART NAME	No. REQ	SIZE	MATERIAL	REMARKS		
18		HANDLE WITH PAD LOCKING	1	-	M.S.				HOTDIP GALV	9	JUMPER CARRIER	3	25 X 3	M.S. PLAT	HOTDIP GALV
17		BRASS BUSH TILTING BASE	1		M.S.				HOTDIP GALV	8	BRADED JUMPER	3	30X3	COPPER	TIN PLATED
16		COUPLING S&S ROD	1	25X25X1175	M.S. SQ. ROD				HOTDIP GALV	7	TERMINAL CONNECTOR	6	-	ALUMLOY CAS	TIN PLATED
15		OPERATING PIPE	1	26 MM HB	GALV PIPE	B.C.LASS				6	TAIL CONTACT	3	-	GUALLOY CAS	TIN PLATED
14		ARCHING CONTACT	6	Ø8.5x101	M.S. ROD				HOTDIP GALV	5	LIMIT OF MOVING POST	2	3/8" BOLT	M.S.	ELETE GALV
13		MALE & FEMALE CONTACT BASE	6		CUALLOY CAST				TIN PLATED	4	BEARING PLATE	2	65X8	M.S.	HOTDIP GALV
12		11 KV POST INSULATOR	9	320 CD	POLYMERIC				REFUTED MAKE	3	MOUNTING HOLE	6	Ø14 HOLE	-	-
11		MALE CONTACT	3	35x6x40	EC Copper				TIN PLATED	2	EARTHING TERMINAL	3	3/8" BOLT	-	ELETE GALV
10		FEMALE CONTACT	6	F 35x3x103	EC Copper				TIN PLATED	1	MOUNTING CHANNEL	3	75X40X774	M.S.	HOTDIP GALV

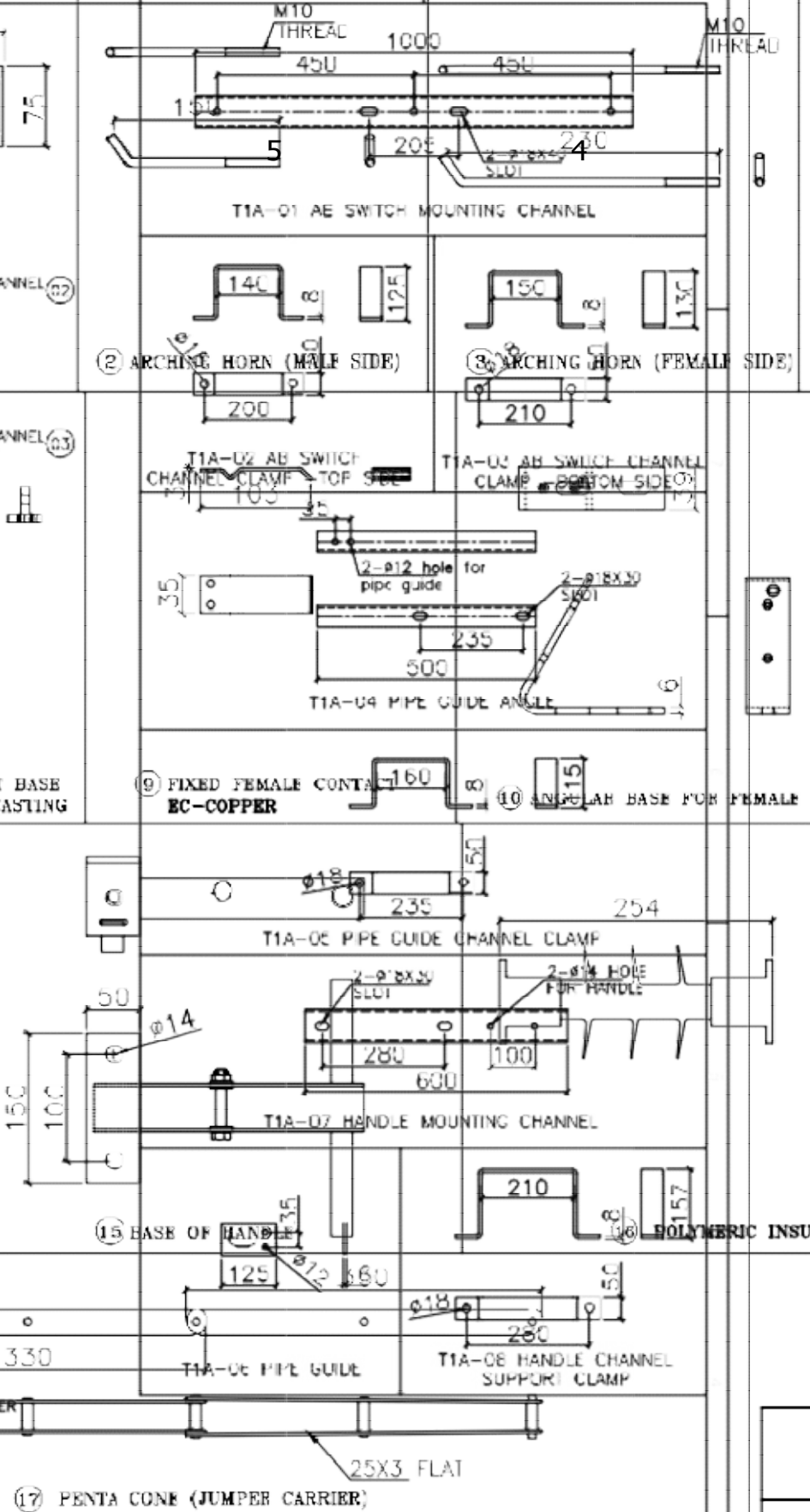
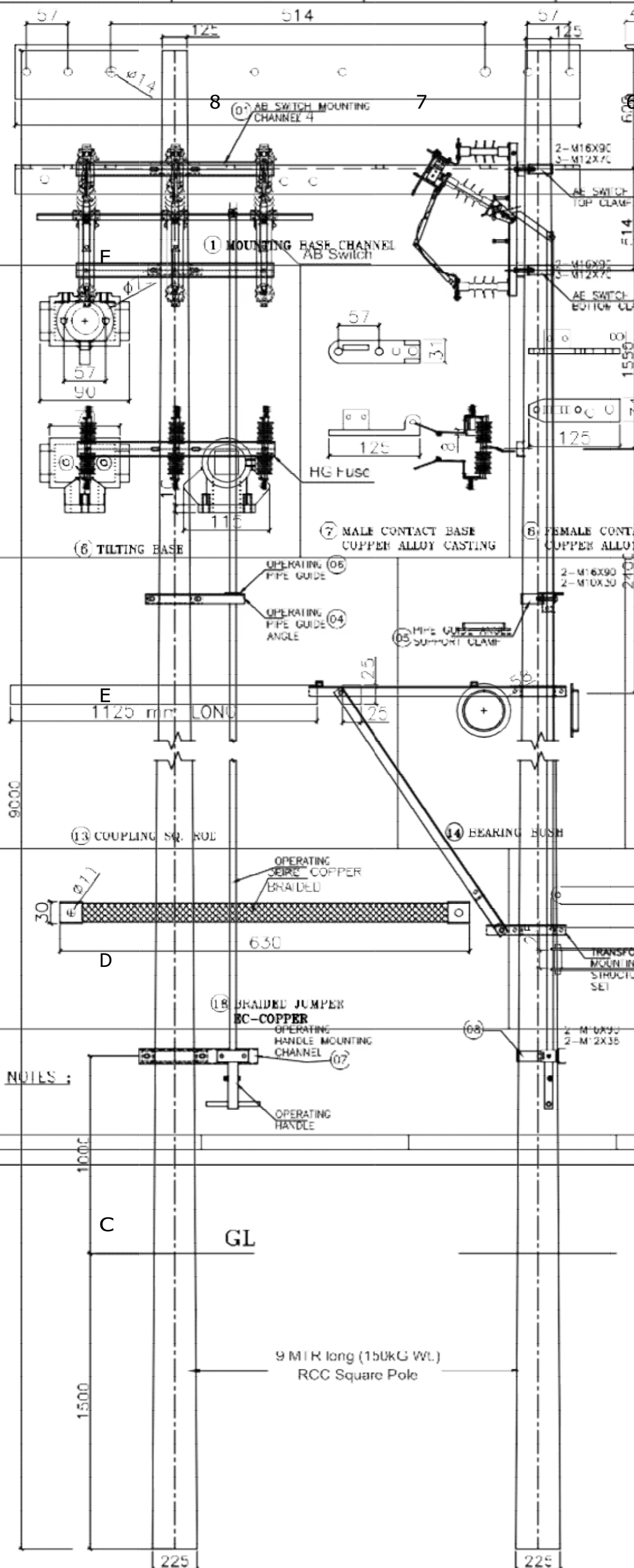
NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTICED.
2. IN DIMS. TOLERANCE SHALL BE $\pm 0.5\%$ MIN. 1 MM.

INSULATOR		SHEET : 1 OF 2 SCALE : 1 : 1	
		DATE : 03.04.19 REVISION : R1	
PRELIMINARY	APPROVAL	CONSTRUCTION	RECORD
			CAD NAME

FILE : G.A. DRAWING OF 11KV VERTICAL TYPE AB
(COS) SWITCH WITH 11KV POLYMERIC PT
INSULATOR

INSULATOR		SHEET : 1 OF 2		SCALE : 1 : 1
ORG. NO. :		DATE : 03.04.19		REVISION : R1
PRELIMINARY	APPROVAL	CONSTRUCTION	RECORD	CAD NAME



BILL OF MATERIAL :-

Mem No.	Item Name	Qty. in one	Section	Length
T1A-01	AE SWITCH MOUNTING CHANNEL	2	C75X40	1000
T1A-02	AE SWITCH CHANNEL CLAMP-TOP SIDE	1	F50X8	470
T1A-03	AE SWITCH CHANNEL CLAMP-BOTTOM SIDE	1	F50X8	500
T1A-04	PIPE GUIDE ANGLE	1	L50X50X6	500
T1A-05	PIPE GUIDE ANGLE SUPPORT CLAMP	1	F50X8	450
T1A-06	PIPE GUIDE	1	F75X6	125
T1A-07	HANDLE MOUNT CHANNEL	1	C75X40	600
T1A-08	HANDLE CHANNEL SUPPORT CLAMP	1	F50X8	615
	NUT BOLT WITH WASHER	2	M10	30
	NUT BOLT WITH WASHER	2	M12	35
	NUT BOLT WITH WASHER	6	M12	70
	NUT BOLT WITH WASHER	8	M16	90

NOTES:-

- ALL DIMENSIONS ARE IN MM.
- IN DIM. TOLERANCE SHALL BE $\pm 5\%$, MIN. 1MM.
- ALL HARDWARE SHOULD BE HDG. HARDWARE GRADE-5.6
- ALL MS MATERIAL SHOULD BE GALVANIZED WITH Zn COATING AS PER IS 4759.
- OPERATING HANDLE SHOULD BE FIXED ON REAR SIDE OF POLE.

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION LTD.

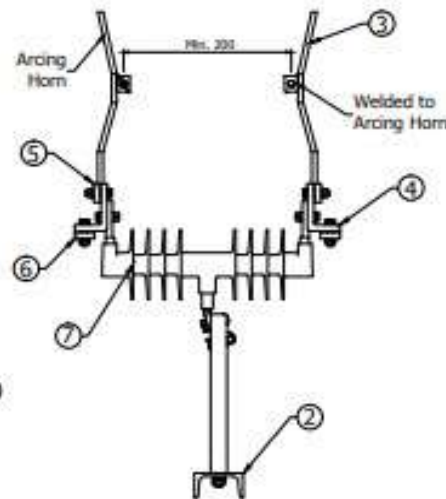
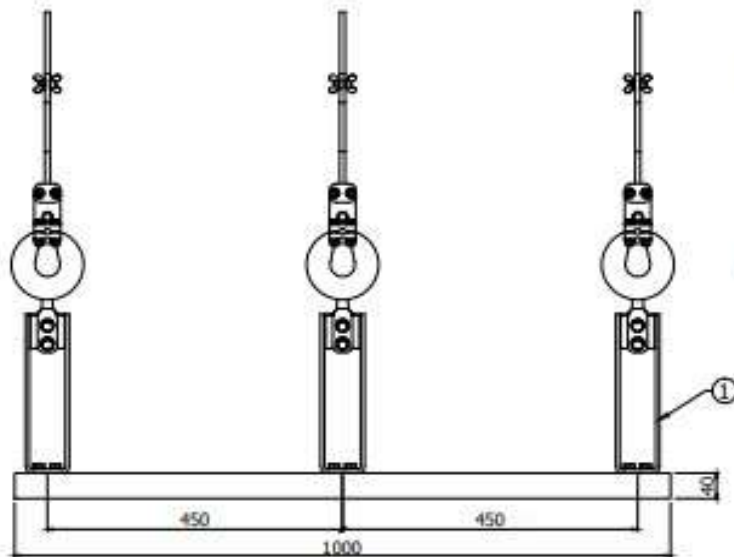
TITLE : GA DRG OF 11KV VERTICAL TYPE AB(GOS) SWITCH WITH POLY. IPI INSULATOR FOR SINGLE POLE HYD. DT STRUCTURE

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	DATE : 24.12.18	REVISION : 0
TENDER	PRELIMINARY	APPROVAL
CONSTRUCTION	ERECTION	RECORD

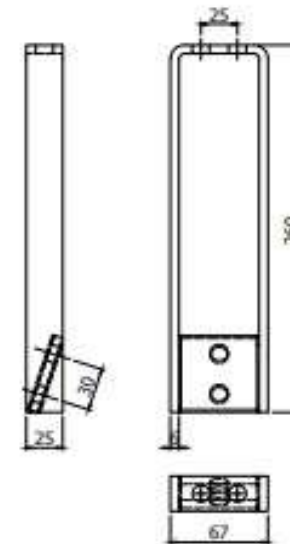
ELEVATION

SIDE VIEW

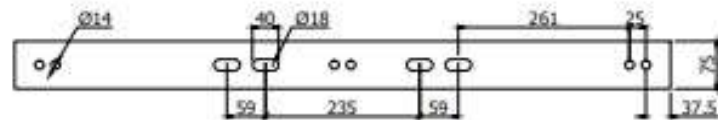
CONTROL NO. UNDER OTHER WORKS (S-01-01-01)	0	---	---	TSPL	TSPL	TSPL	SUBMITTED FOR	✓
REV	DATE	REVISION DETAILS	PREP	CHK	APP			



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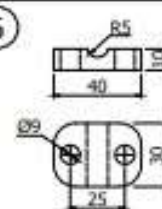
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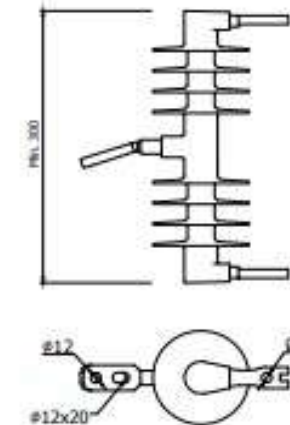
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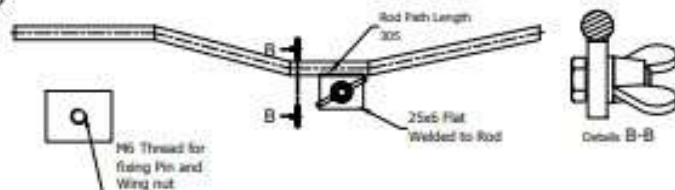
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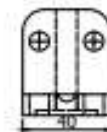
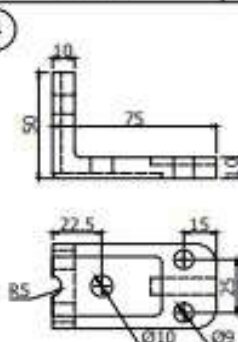
7



3



4



7	INSULATOR	3	-	Polymeric	-
6	GRIPPER FOR CONDUCTOR	6	30x10x40	Aluminium	CASTING
5	GRIPPER FOR HORN	6	30x10x40	Aluminium	CASTING
4	L SHAPED PG CLAMP	6	-	Aluminium	CASTING
3	ARCING HORN	6	Ø 8 MM	M.S.	HDG
2	MOUNTING CHANNEL	1	75X40X1000	M.S.	HDG
1	MOUNTING CLAMP	3	25x6x570	M.S.	HDG

NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTICED.
2. IN DIMS. TOLERANCE SHALL BE +/- 5% MM. 1 MM.

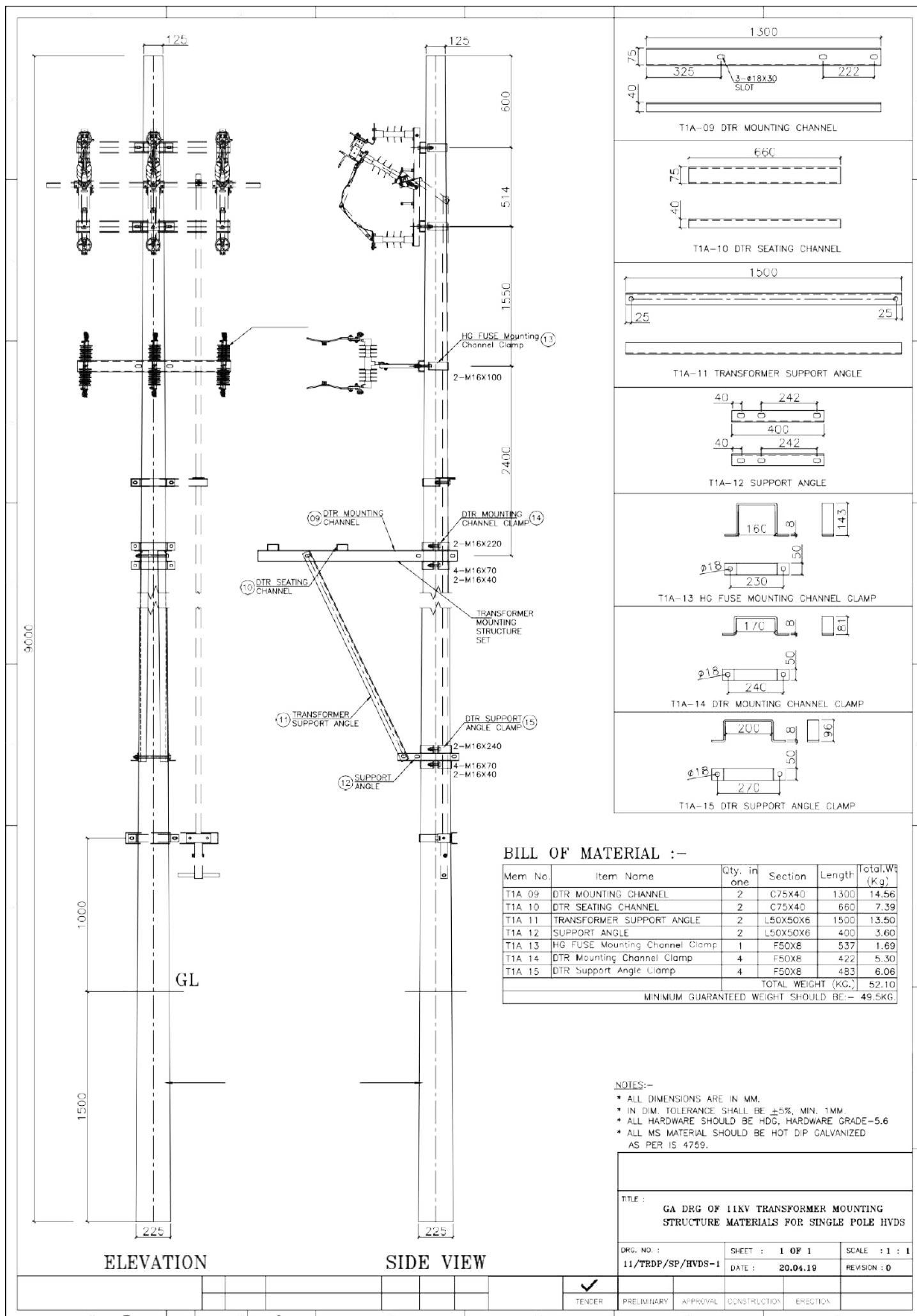
CONTROLLED, UNLESS OTHERWISE SPECIFIED

REV.	DATE	REVISION DETAILS	TSPL	TSPL	TSPL	SUBMITTED FOR	TENDER	PRELIMINARY	APPROVAL	RECORD

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION LTD.

TYPE : 11KV HG FUSE SWITCH (SOLID CORE) VERTICAL TYPE FOR SINGLE POLE HVDS BT STRUCTURE

DWG. NO. :	SHEET : 1 OF 1	SCALE : 1 : 1
DATE : 22.04.18	REVISION : 00	



TECHNICAL SPECIFICATION FOR 11 KV POLYMER COMPOSITE PIN INSULATORS

1.0 SCOPE:

This specification covers design, manufacture, testing and supply of composite Insulators for use in the 11 KV overhead transmission lines and substations. The composite Insulators shall be of the Long rod type Pin Insulators and will be used on lines on which the conductor will be AAA/ACSR of size up to 80 sq.mm. Al. equivalent (Raccoon).

APPLICABLE STANDARDS:

Standards:

Following Indian/International Standards, which shall mean latest revision, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification, shall be referred while accessing conformity of Insulators with these specifications.

In the event of supply of Insulators conforming to standards other than specified, the Bidder shall confirm in his bid that these standards are equivalent or better to those specified. In case of award, salient features of comparison between the standards proposed by the Bidder and those specified in this document will be provided by the Supplier to establish equivalence.

Sl.No.	Indian Standard	Title	International Standard
1		Definition, test methods and acceptance criteria for composite Insulators for A.C. overhead lines above 1000V.	IEC:61109
2	IS:731	Polymer status for overhead power line with a nominal voltage greater than 1000 Volts	IEC:60383
3	IS:2071	Methods of High Voltage Testing.	IEC:60060-1
4	IS:2486	Specification for Insulator fittings for overhead power lines with a nominal voltage greater than 1000V General Requirements and Tests Dimensional Requirements locking devices.	IEC:60120 IEC:60374
5		Thermal Mechanical performance test and mechanical performance	IEC:60575

		teston string Insulators units	
6	IS:13134	Guide for the selection of insulators in respectof polluted condition	IEC:60815
7		Characteristics of string Insulator units of thelong rod type.	IEC:60433
8		Hydrophobicity Clarification Guide.	STRI guide 1.92/1
9		Radio interference characteristics of overhead power lines and high voltage equipment.	CISPR18-2 Part 2
10	IS:8263	Methods of RI Test of HV Insulators	IEC:60437
11		Standard for Insulators – Composite-Distribution Dead -end type.	ANSI-C29.132-2000
12	IS:4759	Hot dip zinc coatings on structural steel & other allied products.	ISO:1459
13	IS:2629	Recommended practice for Hot Dip galvanization for iron and steel	ISO:1461(E)
14	IS:6745	Determination of weight of zinc coating on zinc coated Iron and steel articles.	ISO:1460
15	IS:3203	Methods of testing of local thickness of electroplated coatings.	ISO:2178
16	IS:2633	Testing of Uniformity of coating of zinc coated articles.	
17		Standard specification for glass fiber standards.	ASTM D 578-05
18		Standard specification for compositional analysis by Thermo-gravimetry.	ASTM D 578-05
19	IS:4699	Specification for refined secondary zinc	

TECHNICAL DESCRIPTION OF COMPOSITE INSULATORS:

Service condition:

The polymer Insulators to be supplied shall be suitable for satisfactory continuous operation under conditions as specified below:

(i)	Maximum temperature of air in shed	51°C
(ii)	Minimum temperature of air in shed	-3°C
(iii)	Maximum relative humidity	95% (The humidity sometime approaches saturation point)
(iv)	Minimum relative humidity	10 %

(v)	Average number of dust-storm days per annum	40 days
(vi)	Average number of rainy days per annum	90 days
(vii)	Number of months of tropical monsoon conditions per annum	3 months
(viii)	Average annual rainfall	1250 mm
(ix)	Maximum wind pressure	150 Kg / Sq. mm
(x)	Altitude not exceeding	1100 metres
(The limit of ambient temperature shall be 51°C peak and 38°C average over a period of 24 hours)		

The Composite Pin Insulators long rod type shall be suitable for 3 phase, 50 Hz, effectively earthed 11 KV O/H distribution system in a moderately/heavily polluted atmosphere.

Insulators shall have sheds with good self-cleaning properties. Insulator shed profile, spacing, projection etc. and selection in respect of polluted conditions shall be generally in accordance with the recommendation of IEC-60815/IS: 13134.

The size of Composite insulator, minimum creepage distance and mechanical strength along with hardware fittings shall be as follows:

Type of composite Insulator	Nominal system voltage KV (rms)	Highest system voltage KV (rms)	Visible discharge test voltage KV(rms)	Wet power frequency withstand voltage KV (rms)	Impulse withstand voltage KV (rms)	Minimum creepage distance (mm)	Min. failing load KN	Dia. of FRP Rod (mm)
11 KV Pin Insulator	11	12	9	45	70	320	5	24

Dimensional Tolerance of Composite Insulators:

The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed as follows in line with-IEC 61109:

$\pm \{0,04d+1.5\}$ mm when $d < 300$ mm,

$\pm (0.025d-r-6)$ mm when $d > 300$ mm.

Where, d being the dimensions in millimeters for diameter, length or creepage distance as the case may be,

However, no negative Tolerance shall be applicable to creepage distance.

Interchangeability:

The composite Insulators including the end fitting connection shall be of standard design suitable for use with the hardware fittings of any make conforming to relevant IEC/IS standards.

Corona and RI Performance:

All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating conditions.

Maintenance

The composite insulators offered shall be suitable for use of hot line maintenance technique so that usual hot line operation can be carried out with ease, speed and safety.

BASIC FEATURES:**Design and construction:**

The Composite Pin Insulator shall have a core, housing & weather shed of insulating material and steel/aluminum alloy hardware components for attaching it to the support/conductor.

Core:

It shall be a glass-fiber reinforced epoxy resin rod of high strength (FRP rod). Glass fibers and resin shall be optimized in the FRP rod. Glass fibers shall be Boron free electrically corrosion resistant (ECR) glass fiber or Boron free E-Glass and shall exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP rod shall be manufactured through Pultrusion process. The FRP rod shall be void free. The diameter of FRP rod should be 24 mm only.

Housing (Sheath):

The FRP rod shall be covered by a seamless sheath of a silicone electrometric compound or silicone alloy compound of a thickness of 3 mm minimum.

It should protect the FRP rod against environmental influences, external pollution and humidity. It shall be extruded or directly moulded on the core and shall have chemical bonding with the FRP rod. The strength of the bond shall be greater than the tearing strength of the polymer. Sheath material in the bulk as well as in the sealing/bonding area shall be free from voids.

Weather sheds:

The composite polymer weather sheds made of silicone electrometric compound or silicon alloy compound shall be firmly bonded to the sheath, vulcanized to the sheath or molded as part of the sheath and shall be free from imperfections. It should protect the FRP rod against environment influences, external pollution and humidity. The weather sheds should have silicon content of minimum 30% by weight. The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer. The interface, if any, between sheds and sheath (housing] shall be free from voids. The colour of the weather sheds is Grey & number of sheds 3 with normal sheds type.

End Fittings:

End fittings transmit the mechanical load to the core. They shall be made of spheroidal graphite cast Iron, malleable cast iron or forged steel or aluminum alloy. They shall be connected to the rod by means of a controlled compression technique. The material used in fitting shall be corrosion resistant. As the main duty of the end fitting is the transfer of mechanical load to the core, the fittings should be properly attached to the core by a coaxial or hexagonal compression process and should not damage the individual fibres or crack the core. The gap between fitting and sheath shall be sealed by a flexible silicone electrometric compound or silicone alloy compound sealant. System of attachment of end fitting to the rod shall provide superior sealing performance between housing, i.e. seamless sheath and metal connection. The sealing must be moisture proof. The dimensions of end fittings of Insulators shall be in accordance with the standard dimensions stated in IS: 2486/IEC60120.

WORKMANSHIP:

All the materials shall be of latest design and shall conform to the best engineering practices adopted in the high voltage field. Bidders shall offer only such Insulators as are guaranteed by them to be satisfactory and suitable for continued good service in power transmission lines.

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

The design of the Insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.

The core shall be sound and free of cracks and voids that may adversely affect the Insulators.

Weather sheds shall be uniform in quality. They shall be clean, sound, smooth and shall be free from defects and excessive flashing at parting lines.

End fittings shall be free from cracks, seams, shrinks, air holes and rough edges. End fittings should be effectively sealed to prevent moisture ingress; effectiveness of sealing system must be supported by test documents. All surfaces of the metal parts shall be perfectly smooth without projecting points or irregularities, which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.

All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 610 gm/Sq.m, or 87· m thickness and shall be in accordance with the requirement of IS: 4759, The zinc used for galvanizing shall be of purity 99.5% as per IS: 4699. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. The galvanized metal parts shall be guaranteed to withstand at least four successive dips each lasting for one (1) minute duration under the standard preece test. The galvanizing shall be carried out only after any machining.

EQUIPMENT MARKING:

Each insulator unit shall be legibly and indelibly marked with the following details as per IEC-61109:

- (a) Month & Year of manufacture and guarantee period
- (b) Min. failing load/guaranteed mechanical strength in kilo Newton followed by the word 'KN' to facilitate easy identification.
- (c) Manufacturer's name/Trade mark & Purchaser's name. (TANGEDCO/IPDS/DDUGJY/UDAY as the case may be)
- (d)

BID DRAWINGS:

The Bidder shall furnish full description and illustration of the material offered. The Bidder shall furnish along with the bid the outline drawing (3 copies) of each insulator unit including a cross sectional view of the long rod insulator unit. The drawing shall include but not be limited to the following information:

- (a) Long rod diameter with manufacturing tolerances
- (b) Minimum Creepage distance with positive tolerance
- (c) Protected creepage distance
- (d) Eccentricity of the long rod unit
 - (i) Axial run out
 - (ii) Radial run out
- (e) Unit mechanical and electrical characteristics
- (f) Size and weight tongue & clevis
- (g) Weight of composite long rod unit.
- (h) Materials
 - (i) Identification mark

(ii) Manufacturer's catalogue number

After placement of award, the supplier shall submit full dimensioned manufacturing insulator drawing containing all the details in three copies to the Owner for approval.

8.0 Required Guaranteed Technical Particulars for 11 KV Polymer Composite Pin Insulators:

Sl. No.	Test Particulars	Values
1	Working voltage	11 KV
2	Highest System voltage	12 KV
3	Dry Power Frequency Withstand Voltage	70 KV
4	Wet Power Frequency Withstand Voltage	45 KV
5	Dry Flashover Voltage	80 KV
6	Wet Flashover Voltage	50 KV
7	Dry Lightning Impulse withstand Voltage	Positive: 130 KV, Negative: 140 KV
8	Dry Lightning Impulse Flashover Voltage	Positive: 130 KV, Negative: 140 KV
9	Dia of FRP Rod	24 mm
10	Minimum Failing load	5 KN
11	Minimum Creepage distance	320 mm
12	Dia of First Outer Shell (min)	110 mm
13	Dia of Second Outer Shell (min)	110 mm
14	Dry Arc Distance	170 mm
15	RIV at 1 MHz when energized 10 KV rms under dry condition	100 micro volts
16	No. of weather sheds	3
17	Colour of sheds	Grey
18	Total Length of the Insulator	390mm $\pm$ 15
19	Weight (minimum)	1.1 kg

TESTS AND STANDARDS:

Insulators offered shall be manufactured with the same configuration & raw materials as used in the Insulators for which design & type test reports are submitted. The manufacturer shall submit a certificate for the same. The design& type test reports submitted shall not be more than 5 years old.

Design tests:

Manufacturer should submit test report for design test as per IEC-61109 (Clause-5) & its latest amendments along with the bid. Additionally following tests shall be carried out or reports for the tests shall be submitted after award of contract:

UV test: The test shall be carried out in line with clause 7.2 of ANSI C29.13.

Type Tests:

The Tenderer shall furnish detailed Type Test report of the offered composite insulators as per IEC 61109 from NABL approved lab to prove that the composite insulators offered meet the requirements of the specifications. These type tests should have been carried out within 5 years prior to the date of opening of this tender. The following type tests shall be conducted on a suitable number of individual insulator units, components, materials or complete strings. The type test contains the following 7 Nos. of test reports should be invariably submitted along with the bid or otherwise the offers will be rejected.

Sl. No	Description of type test	Ten procedure/standard
1.	Dry lightning impulse withstand voltage test	As per IEC 61109
2.	Wet power frequency test	As per IEC 61 109
3.	Mechanical load-time test – Bending Load	As per IEC 61 109
4.	Radio interference test	As per IEC 61109 revised
5.	Recovery of Hydrophobicity test	As per Annexure-A This test may be repeated every 3yrs by the manufacturer
6.	Chemical composition test for silicon content	As per Annexure-A or any other test method acceptable to the owner
7.	Brittle fracture resistance test	As per Annexure - A

It shall be the option of the owner to accept the Insulators based on Type Test reports submitted by the manufacturer. The owner shall be free to repeat the Type Test & may witness the same.

Note: The owner, for the purpose of facilitating the type tests, may ask the bidders to quote test charges separately

All the Type Tests given in Clause No. 8.2 in addition to routine & acceptance test shall be carried out on insulator along with hardware fittings wherever required.

Routine Tests:

SN	Description	Standard
1	Identification of marking	As per IEC: 61109
2	Visual Inspection	As per IEC 61109
3	Mechanical routine test	As per IEC: 61109

All routine tests as stipulated in the relevant standards shall be carried out and routine tests certificates shall be submitted before inspection. The routine tests will also be carried out on select samples during inspection by TANGEDCO officials. The materials may be rejected if the test results are not satisfactory.

Every polymeric insulator shall withstand mechanical routine test at ambient temperature tensile load at RTL corresponding to at least 50% of the SML for at least 10 sec.

Acceptance (sample) Tests:

The test samples after having with stood the routine test shall be subjected to the following acceptance test.

(a)	Verification of dimensions	: IEC: 61109,
(b)	Verification of the locking system (if applicable)	: IEC: 61109
(c)	Galvanizing test	: IS:2633/IS:6745
(d)	Verification of the specified mechanical load	: IEC: 61109
(e)	Verification of tightness of the interface between end fitting and insulators housing mechanical load	: Clause 7.4 IEC: 611 09, amendment 1 of 1995

Tests During Manufacture:

Following tests shall also be carried out on all components as applicable

- Chemical analysis of zinc used for galvanizing
- Chemical analysis, mechanical, metallographic test and magnetic particle inspection for malleable castings.
- Chemical analysis, hardness tests and magnetic particle inspection for forgings.

Co-ordination for Testing:

The Supplier shall have to co-ordinate testing of Insulators with hardware fittings to be supplied by other Supplier and shall have to guarantee overall satisfactory performance of the Insulators with the hardware fittings.

Quality assurance plan:

The successful bidder shall submit following information to the owner:

Test certificates of the raw materials and bought out accessories.

Statement giving list of important raw materials, their grades along with names of sub-suppliers for raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in presence of bidder's representative.

List of manufacturing facilities available.

Level of automation achieved and lists of areas where manual processing exists.

List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

List of testing equipments available with the bidder for final testing of equipment along with valid calibration reports.

The manufacturer shall submit Manufacturing Quality Plan (MQP) for approval & the same shall be followed during manufacture and testing,

The successful bidder shall submit the routine test certificates of bought out raw materials / accessories and central excise passes for raw material at the time of inspection.

Guarantee:

The supplier of insulators shall guarantee satisfactory performance of the insulators for a period of 36 months from the date of receipt of material at stores by the consignee in good condition.

Test reports:

Copies of the Design test, Type Test & Acceptance Certificates conforming to relevant IS/IEC & duly signed by the tenderer should be enclosed along with the tender offer.

Record of routine test reports shall be maintained by the supplier at his works for periodic inspection by the owner's representative.

Test certificates of test during manufacture shall be maintained by the supplier. These shall be produced for verification as and when desired by purchaser.

Random samples of materials supplied will be tested (both, Routine & Type Tests) departmentally or through approved Govt. Laboratory at purchasers cost and for any non-conformity to relevant IS. with subsequent amendments thereof, full supplies will be rejected. The rejected materials will be taken back from department stores within 15 days from date of intimation received. If initial payment had already been made, the balance payment will be forfeited and any other losses or damages including testing charges will also be claimed. Future supplies in such cases will be accepted and paid for only after the results of the samples tested are satisfactory. In addition, the guarantee period will also be extended for subsequent supplies at the discretion of the purchaser.

INSPECTION:

The Owner's representative shall at all times be entitled to have access to the works and all places of manufacture, where insulator, and its component parts shall be manufactured and the representatives shall have full facilities for unrestricted inspection of the Supplier's and sub-Supplier's works, raw materials, manufacture of the material and for conducting necessary test as detailed herein.

The material for final inspection shall be offered by the Supplier only under packed condition. The Owner shall select samples at random from the packed lot for carrying out acceptance tests. The lot offered for inspection shall be homogeneous and shall contain Insulators manufactured in 3-4 consecutive weeks.

Not less than 15 days advance intimation shall be given about the quantity of materials that will be ready for inspection to the TANGEDCO's Officers. The arrangement for inspection shall be made by supplier in such a way that the delivery schedule is kept up. The materials shall not be despatched without instruction from TANGEDCO.

Factory inspection will be done by the TANGEDCO's officers to assess the genuineness in manufacturing the tendered materials and to assess whether the firm has infrastructural facilities to manufacture the same.

The acceptance of any quantity of material shall in no way relieve the Supplier of his responsibility for meeting all the requirements of the specification and shall not prevent subsequent rejection, if such materials are later found to be defective.

PACKING:

All insulators shall be packed in country wooden box with the material shall not normally exceed 50 Kg to avoid handling problem. The wooden box shall be suitable for outdoor storage under wet climate during rainy season & protect insulator from Rats & other insects.

The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field.

Suitable cushioning, protective padding, or dunnage or spacers shall be provided to prevent damage or deformation during transit and handling.

All packing cases shall be marked legibly and correctly so as to ensure safe arrival at their destination and to avoid the possibility of goods being lost or wrongly dispatched on account of faulty packing and faulty or illegible markings. Each wooden case/crate/corrugated box shall have all the markings stenciled on it in indelible ink.

The bidder shall provide instructions regarding handling and storage precaution to be taken at site.

Annexure A
Tests on Polymer Insulator
Units

1 RIV Test
(Dry):

The insulator string along with complete hardware fittings shall have a radio interference voltage level below 100 micro volts at one MHz when subjected to

50 Hz AC voltage of 10 KV, 20 KV & 30 KV for 11 KV, 22 KV & 33 KV class insulators respectively under dry condition. The test procedure shall be in accordance with IS: 326B / I EC : 437/CISPfi 18-2.

2 Brittle Fracture Resistance Test:

Brittle fracture test shall be carried out on naked rod along with end fittings by applying '1 n HNO₃ acid' (63 g cone, HNO₃ added to 937 g water) to the rod. The rod should be held at 80% of SML for the duration of the test. The rod should not fail within the 96 hour test duration. Test arrangement should ensure continuous wetting of the rod with Nitric acid.

3 Recovery of Hydrophobicity & Corona test:

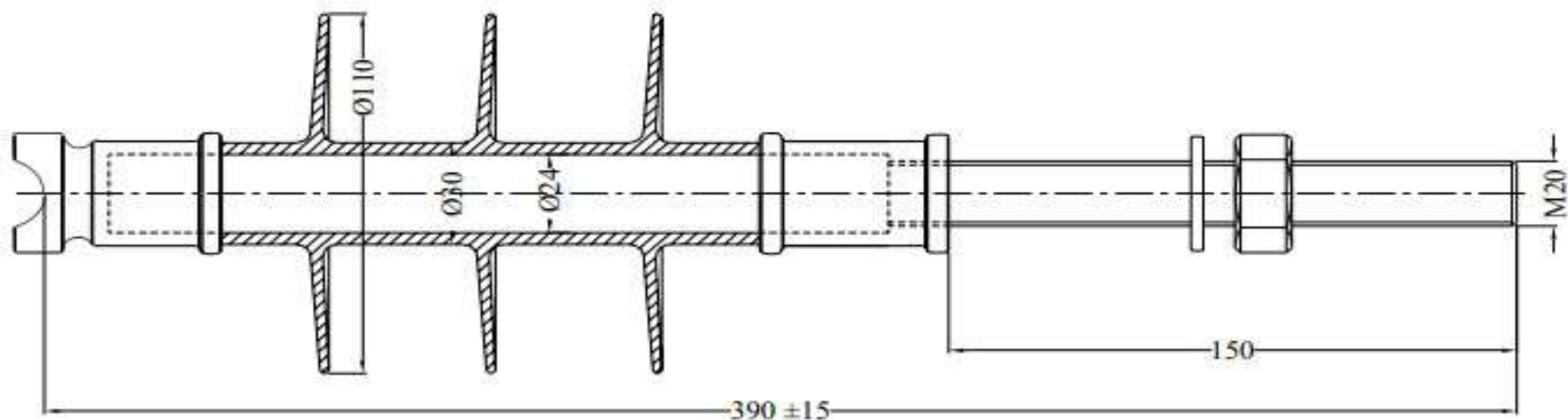
The test shall be carried out on 4mm thick samples of 5cm x 7cm

- i) The surface of selected samples shall be cleaned with isopropyl alcohol. Allow the surface to dry and spray with water. Record the Hydrophobicity classification in line with STRI guide for Hydrophobicity classification. Dry the sample surface.
- ii) The sample shall be subjected to mechanical stress by bending the sample over a ground electrode. Corona is continuously generated by applying 12 KV to a needle like electrode placed 1mm above the sample surface. The test shall be done for 100 hrs.
- iii) Immediately after the corona treatment, spray the surface with water and record the HC classification. Dry the surface and repeat the corona treatment as at clause 7 above. Note HC classification. Repeat the cycle for 1000 hrs. or until an HC of 6 or 7 is obtained. Dry the sample surface.
- iv) Allow the sample to recover and repeat hydrophobicity measurement at several time intervals. Silicone rubber should recover to HC 1 - HC 2 within 24 to 48 hours, depending on the material and the intensity of the corona treatment.

4 Chemical composition test for Silicon content:

The content of silicon in the composite polymer shall be evaluated by EDX (Energy Dispersion X-ray) Analysis or Thermo-gravimetric analysis. The test may be carried out at CPRI or any other NABL accredited laboratory.

11 kv Pin Polymer Insulator



GUARANTEED TECHNICAL SPECIFICATIONS

S. No.	DESCRIPTION	VALUE	UCM
A DIMENSIONS			
01	CREEPAGE DISTANCE (min.)	320	mm.
02	DRY ARC DISTANCE	170	mm.
03	SECTIONAL LENGTH	390 ± 20	mm.
B ELECTRICAL CHARACTERISTICS			
01	NOMINAL SYSTEM VOLTAGE	11	kV
02	MAX. SYSTEM VOLTAGE	12	kV
03	SYSTEM FREQUENCY	50	Hz
04	WITHSTAND VOLTAGE LEVELS		
a	P.F. DRY (1 min.)	70	kV(rms)
b	P.F. WET (1 min.)	45	kV(rms)
c	LIGHTING IMPULSE (Positive)	+130	kvp
	WITHSTAND (Negative)	-140	kvp
d	RIV at 1 MHz when energized 10kV (rms) under dry condition	<100	µV
C MECHANICAL CHARECTRISTICS			
01	a Mechanical Failing Load	05	kN

TOLERANCE

* $\pm (0.04 \times d + 1.5)$ mm when $d < 300$ mm.

* $\pm (0.025 \times d + 6)$ mm when $d > 300$ mm.

TANGEDCO

TECHNICAL SPECIFICATION FOR 11 KV POLYMER COMPOSITE DISC INSULATORS (B&S) Type

1.0 SCOPE:

This Specification covers the design, manufacture testing and supply of Polymer composite Insulators for use in the 11 KV Overhead Transmission lines and substations as per schedule of requirements attached. The Polymer composite insulators are meant for use on 3 phases, 50 cycles power system and shall be of the following type: Long rod insulators for conductors in tension application at angle/cut points. The insulators shall be of Ball & Socket type.

APPLICABLE STANDARDS:

Standards:

Following Indian/International Standards, which shall mean latest revision, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification, shall be referred while accessing conformity of Insulators with these specifications.

In the event of supply of Insulators conforming to standards other than specified, the Bidder shall confirm in his bid that these standards are equivalent or better to those specified. In case of award, salient features of comparison between the standards proposed by the Bidder and those specified in this document will be provided by the Supplier to establish equivalence.

Sl	Indian Standard	Title	International Standard
1		Definition, test methods and acceptance criteria for composite Insulators for A.C. overhead lines above 1000V.	IEC:61109
2	IS:731	Polymer status for overhead power line with a nominal voltage greater than 1000 Volts	IEC:60383
3	IS:2071	Methods of High Voltage Testing.	IEC:60060-1
4	IS:2486	Specification for Insulator fittings for overhead power lines with a nominal voltage greater than 1000V General Requirements and Tests Dimensional Requirements locking devices.	IEC:60120 IEC:60374
5		Thermal Mechanical performance test and mechanical performance test on string Insulators units	IEC:60575

6	IS:1313 4	Guide for the selection of insulators in respect of polluted condition	IEC:60815
7		Characteristics of string Insulator units of the long rodtype.	IEC:60433
8		Hydrophobicity Clarification Guide.	STRI guide 1.92/1
9		Radio interference characteristics of overhead powerlines and high voltage equipment.	CISPR18-2 Part 2
10	IS:8263	Methods of RI Test of HV Insulators	IEC:60437
11		Standard for Insulators – Composite-Distribution Dead -end type.	ANSI- C29.132- 2000
12	IS:4759	Hot dip zinc coatings on structural steel & other allied products.	ISO:1459
13	IS:2629	Recommended practice for Hot Dip galvanization for iron and steel	ISO:1461(E)
14	IS:6745	Determination of weight of zinc coating on zinc coated Iron and steel articles.	ISO:1460
15	IS:3203	Methods of testing of local thickness of electroplated coatings.	ISO:2178
16	IS:2633	Testing of Uniformity of coating of zinc coated articles.	
17		Standard specification for glass fiber standards.	ASTM D 578-05
18		Standard specification for compositional analysis by Thermo-gravimetry.	ASTM D 578-05
19	IS:4699	Specification for refined secondary zinc	

TECHNICAL DESCRIPTION OF COMPOSITE INSULATORS:

Service condition:

The polymer Insulators to be supplied shall be suitable for satisfactory continuous operation under conditions as specified below:

(i)	Maximum temperature of air in shed	51°C
(ii)	Minimum temperature of air in shed	-3°C
(iii)	Maximum relative humidity	95% (The humidity sometime approaches saturation point)
(iv)	Minimum relative humidity	10 %
(v)	Average number of dust-storm days per annum	40 days
(vi)	Average number of rainy days per annum	90 days

(vii)	Number of months of tropical monsoon conditions per annum	3 months
(viii)	Average annual rainfall	1250 mm
(ix)	Maximum wind pressure	150 Kg / Sq. mm
(x)	Altitude not exceeding	1100 metres
(The limit of ambient temperature shall be 51°C peak and 38°C average over a period of 24 hours)		

The Composite Disc Insulators long rod type shall be suitable for 3 phase, 50 Hz, effectively earthed 11 KV O/H distribution system in a moderately/heavily polluted atmosphere.

Insulators shall have sheds with good self-cleaning properties. Insulator shed profile, spacing, projection etc. and selection in respect of polluted conditions shall be generally in accordance with the recommendation of IEC-60815/IS: 13134.

The size of Composite insulator, minimum creepage distance and mechanical strength along with hardware fittings shall be as follows:

Type of composite Insulator	Nominal system voltage KV (rms)	Highest system voltage KV (rms)	Visible discharge test voltage KV(rms)	Wet power frequency withstand voltage KV(rms)	Impulse withstand voltage KV (rms)	Minimum creepage distance (mm)	Min. failing load KN	Dia. of FRP Rod (mm)	Pin ball Shank diameter in mm
11 KV VDisc Insulator	11	12	9	45	110	320	45	16	16

Dimensional Tolerance of Composite Insulators:

The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed as follows in line with-IEC 61109:

$\pm \{0,04d+1.5\}$ mm when $d < 300$ mm,

$\pm (0.025d-r-6)$ mm when $d > 300$ mm.

Where, d being the dimensions in millimeters for diameter, length or creepage distance as the case may be,

However, no negative Tolerance shall be applicable to creepage distance.

Interchangeability:

The composite Insulators including the end fitting connection shall be of standard design suitable for use with the hardware fittings of any make conforming to relevant IEC/IS standards.

Corona and RI Performance:

All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating conditions.

Maintenance

The composite insulators offered shall be suitable for use of hot line maintenance technique so that usual hot line operation can be carried out with ease, speed and safety.

BASIC FEATURES:**Design and construction:**

The Composite Disc Insulator shall have a core, housing & weather shed of insulating material and steel/aluminum alloy hardware components for attaching it to the support/conductor.

Core:

It shall be a glass-fiber reinforced epoxy resin rod of high strength (FRP rod). Glass fibers and resin shall be optimized in the FRP rod. Glass fibers shall be Boron free electrically corrosion resistant (ECR) glass fiber or Boron free E-Glass and shall exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP rod shall be manufactured through Pultrusion process. The FRP rod shall be void free. The diameter of FRP rod should be minimum 16 mm.

Housing (Sheath):

The FRP rod shall be covered by a seamless sheath of a silicone electrometric compound or silicone alloy compound of a thickness of 3 mm minimum.

It should protect the FRP rod against environmental influences, external pollution and humidity. It shall be extruded or directly moulded on the core and shall have chemical bonding with the FRP rod. The strength of the bond shall be greater than the tearing strength of the polymer. Sheath material in the bulk as well as in the sealing/bonding area shall be free from voids.

Weather sheds:

The composite polymer weather sheds made of silicone electrometric compound or silicon alloy compound shall be firmly bonded to the sheath, vulcanized to the sheath or molded as part of the sheath and shall be free from imperfections. It should protect the FRP rod against environment influences, external pollution and humidity. The weather sheds should have silicon content

of minimum 30% by weight. The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer. The interface, if any, between sheds and sheath (housing) shall be free from voids. The colour of the weather sheds is Grey & number of sheds 3 with normal sheds type.

End Fittings:

End fittings transmit the mechanical load to the core. They shall be made of spherical graphite cast Iron, malleable cast iron or forged steel or aluminum alloy. They shall be connected to the rod by means of a controlled compression technique. The material used in fitting shall be corrosion resistant. As the main duty of the end fitting is the transfer of mechanical load to the core, the fittings should be properly attached to the core by a coaxial or hexagonal compression process and should not damage the individual fibres or crack the core. The gap between fitting and sheath shall be sealed by a flexible silicone electrometric compound or silicone alloy compound sealant. System of attachment of end fitting to the rod shall provide superior sealing performance between housing, i.e. seamless sheath and metal connection. The sealing must be moisture proof.

The dimensions of end fittings of Insulators shall be in accordance with the standard dimensions stated in IS: 2486/IEC60120.

WORKMANSHIP:

All the materials shall be of latest design and shall conform to the best engineering practices adopted in the high voltage field. Bidders shall offer only such Insulators as are guaranteed by them to be satisfactory and suitable for continued good service in power transmission lines.

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

The design of the Insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.

The core shall be sound and free of cracks and voids that may adversely affect the Insulators.

Weather sheds shall be uniform in quality. They shall be clean, sound, smooth and shall be free from defects and excessive flashing at parting lines.

End fittings shall be free from cracks, seams, shrinks, air holes and rough edges. End fittings should be effectively sealed to prevent moisture ingress; effectiveness of sealing system must be supported by test documents. All surfaces of the metal parts shall be perfectly smooth without projecting points or irregularities, which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.

All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 610 gm/Sq.m, or 87· m thickness and shall be in accordance with the requirement of IS: 4759, The zinc used for galvanizing shall be of purity 99.5% as per IS: 4699. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. The galvanized metal parts shall be guaranteed to withstand at least four successive dips each lasting for one (1) minute duration under the standard preece test. The galvanizing shall be carried out only after any machining.

EQUIPMENT MARKING:

Each insulator unit shall be legibly and indelibly marked with the following details as per IEC-61109:

- (a) Month & Year of manufacture and guarantee period
- (b) Min. failing load/guaranteed mechanical strength in kilo Newton followed by the word 'KN' to facilitate easy identification.
- (c) Manufacturer's name/Trade mark & Purchaser's name. (TANGEDCO/IPDS/DDUGJY/UDAY as the case may be)

BID DRAWINGS:

The Bidder shall furnish full description and illustration of the material offered. The Bidder shall furnish along with the bid the outline drawing (3 copies) of each insulator unit including a cross sectional view of the long rod insulator unit. The drawing shall include but not be limited to the following information:

- (a) Long rod diameter with manufacturing tolerances
- (b) Minimum Creepage distance with positive tolerance
- (c) Protected creepage distance
- (d) Eccentricity of the long rod unit
 - (i) Axial run out
 - (ii) Radial run out
- (e) Unit mechanical and electrical characteristics
- (f) Size and weight tongue & clevis
- (g) Weight of composite long rod unit.
- (h) Materials
 - (i) Identification mark
 - (ii) Manufacturer's catalogue number

After placement of award, the supplier shall submit full dimensioned manufacturing insulator drawing containing all the details in three copies to the Owner for approval.

8.0 Required Guaranteed Technical Particulars for 11 KV Polymer Composite Disc Insulators:

Sl. No.	Test Particulars	Values
1	Working voltage	11 KV
2	Highest System voltage	12 KV
3	Dry Power Frequency Withstand Voltage	65 KV
4	Wet Power Frequency Withstand Voltage	45 KV
5	Dry Flashover Voltage	70 KV
6	Wet Flashover Voltage	50 KV
7	Dry Lightning Impulse withstand Voltage	Positive: 110 KV, Negative: 120 KV
8	Dry Lightning Impulse Flashover Voltage	Positive: 120 KV, Negative: 130 KV
9	Dia of FRP Rod (minimum)	16 mm
10	Minimum Failing load (Tension load)	45 KN
11	Minimum Creepage distance (minimum)	320 mm
12	Dia of First Outer Shell (minimum)	100 mm
13	Dia of Second Outer Shell (minimum)	100 mm
14	Dry Arc Distance (minimum)	170 mm
15	RIV at 1 MHz when energized 10 KV rms under dry condition	100 micro volts
16	No. of weather sheds (minimum)	3
17	Colour of sheds	Grey
18	Total Length of the Insultor	270mm $\pm$ 15
19	Weight (minimum)	0.750 kg

TESTS AND STANDARDS:

Insulators offered shall be manufactured with the same configuration & raw materials as used in the Insulators for which design & type test reports are submitted. The manufacturer shall submit a certificate for the same. The design& type test reports submitted shall not be more than 5 years old.

Design tests:

Manufacturer should submit test report for design test as per IEC-61109 (Clause-5) & its latest amendments along with the bid. Additionally following tests shall be carried out or reports for the tests shall be submitted after award of contract:

UV test: The test shall be carried out in line with clause 7.2 of ANSI C29.13.

Type Tests:

The Tenderer shall furnish detailed Type Test report of the offered composite insulators as per IEC 61109 from NABL approved lab to prove that the

composite insulators offered meet the requirements of the specifications. These type tests should have been carried out within 5 years prior to the date of opening of this tender. The following type tests shall be conducted on a suitable number of individual insulator units, components, materials or complete strings. The type test contains the following 7 Nos. of test reports should be invariably submitted along with the bid or otherwise the offers will be rejected.

Sl. No	Description of type test	Test procedure/standard
1.	Dry lightning impulse withstand voltage test	As per IEC 61109
2.	Wet power frequency test	As per IEC 61 109
3.	Mechanical load-time test – Tensile Load	As per IEC 61 109
4.	Radio interference test	As per IEC 61109 revised
5.	Recovery of Hydrophobicity test	As per Annexure-A This test may be repeated every 3yrs by the manufacturer
6.	Chemical composition test for silicon content	As per Annexure-A or any other test method acceptable to the owner
7.	Brittle fracture resistance test	As per Annexure - A

It shall be the option of the owner to accept the Insulators based on Type Test reports submitted by the manufacturer. The owner shall be free to repeat the Type Test & may witness the same.

Note: The owner, for the purpose of facilitating the type tests, may ask the bidders to quote test charges separately

All the Type Tests given in Clause No. 8.2 in addition to routine & acceptance test shall be carried out on insulator along with hardware fittings wherever required.

Routine Tests:

SN	Description	Standard
1	Identification of marking	As per IEC: 61109
2	Visual Inspection	As per IEC 61109
3	Mechanical routine test	As per IEC: 61109

All routine tests as stipulated in the relevant standards shall be carried out and routine tests certificates shall be submitted before inspection. The routine tests will also be carried out on select samples during inspection by TANGEDCO officials. The materials may be rejected if the test results are not satisfactory.

Every polymeric insulator shall withstand mechanical routine test at ambient temperature tensile load at RTL corresponding to at least 50% of the SML for at least 10 sec.

Acceptance (sample) Tests:

The test samples after having with stood the routine test shall be subjected to the following acceptance test.

(a)	Verification of dimensions	:	IEC: 61109,
(b)	Verification of the locking system	:	IEC: 61109
(c)	Galvanizing test	:	IS:2633/IS:6745
(d)	Verification of the specified mechanical load	:	IEC: 61109
(e)	Verification of tightness of the interface between end fitting and insulators housing mechanical load	:	Clause 7.4 IEC: 611 09, amendment 1 of 1995

Tests During Manufacture:

Following tests shall also be carried out on all components as applicable

- a) Chemical analysis of zinc used for galvanizing
- b) Chemical analysis, mechanical, metallographic test and magnetic particle inspection for malleable castings.
- c) Chemical analysis, hardness tests and magnetic particle inspection for forgings.

Co-ordination for Testing:

The Supplier shall have to co-ordinate testing of Insulators with hardware fittings to be supplied by other Supplier and shall have to guarantee overall satisfactory performance of the Insulators with the hardware fittings.

Quality assurance plan:

The successful bidder shall submit following information to the owner:

Test certificates of the raw materials and bought out accessories.

Statement giving list of important raw materials, their grades along with names of sub-suppliers for raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in presence of bidder's representative.

List of manufacturing facilities available.

Level of automation achieved and lists of areas where manual processing exists.

List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

List of testing equipments available with the bidder for final testing of equipment along with valid calibration reports.

The manufacturer shall submit Manufacturing Quality Plan (MQP) for approval & the same shall be followed during manufacture and testing,

The successful bidder shall submit the routine test certificates of bought out raw materials / accessories and central excise passes for raw material at the time of inspection.

Guarantee:

The supplier of insulators shall guarantee satisfactory performance of the insulators for a period of 18 months from the date of receipt of material at stores by the consignee in good condition.

Test reports:

Copies of the Design test, Type Test & Acceptance Certificates conforming to relevant IS/IEC & duly signed by the tenderer should be enclosed along with the tender offer.

Record of routine test reports shall be maintained by the supplier at his works for periodic inspection by the owner's representative.

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In addition, the guarantee period will also be extended for subsequent supplies at the discretion of the purchaser.

INSPECTION:

The Owner's representative shall at all times be entitled to have access to the works and all places of manufacture, where insulator, and its component parts shall be manufactured and the representatives shall have full facilities for unrestricted inspection of the Supplier's and sub-Supplier's works, raw materials, manufacture of the material and for conducting necessary test as detailed herein.

The material for final inspection shall be offered by the Supplier only under packed condition. The Owner shall select samples at random from the packed lot for carrying out acceptance tests. The lot offered for inspection shall be

homogeneous and shall contain Insulators manufactured in 3-4 consecutive weeks.

Not less than 15 days advance intimation shall be given about the quantity of materials that will be ready for inspection to the TANGEDCO's Officers. The arrangement for inspection shall be made by supplier in such a way that the delivery schedule is kept up. The materials shall not be despatched without instruction from TANGEDCO.

Factory inspection will be done by the TANGEDCO's officers to assess the genuineness in manufacturing the tendered materials and to assess whether the firm has infrastructural facilities to manufacture the same.

The acceptance of any quantity of material shall in no way relieve the Supplier of his responsibility for meeting all the requirements of the specification and shall not prevent subsequent rejection, if such materials are later found to be defective.

PACKING:

All insulators shall be packed in country wooden box with the material shall not normally exceed 50 Kg to avoid handling problem. The wooden box shall be suitable for outdoor storage under wet climate during rainy season & protect insulator from Rats & other insects.

The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field.

Suitable cushioning, protective padding, or dunnage or spacers shall be provided to prevent damage or deformation during transit and handling.

All packing cases shall be marked legibly and correctly so as to ensure safe arrival at their destination and to avoid the possibility of goods being lost or wrongly dispatched on account of faulty packing and faulty or illegible markings. Each wooden case/crate/corrugated box shall have all the markings stenciled on it in indelible ink.

The bidder shall provide instructions regarding handling and storage precaution to be taken at site.

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Units

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(Dry):

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2 Brittle Fracture Resistance Test:

Brittle fracture test shall be carried out on naked rod along with end fittings by applying '1 n HNO₃ acid' (63 g cone, HNO₃ added to 937 g water) to the rod. The rod should be held at 80% of SML for the duration of the test. The rod should not fail within the 96 hour test duration. Test arrangement should ensure continuous wetting of the rod with Nitric acid.

3 Recovery of Hydrophobicity & Corona test:

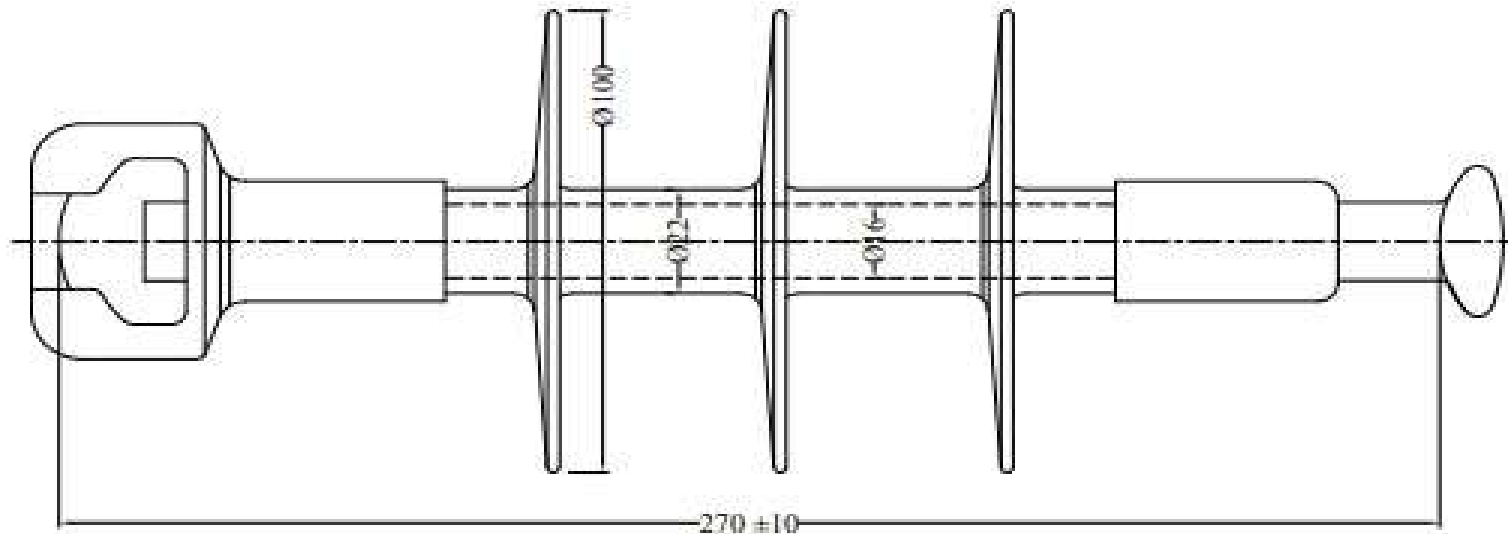
The test shall be carried out on 4mm thick samples of 5cm x 7cm

- i) The surface of selected samples shall be cleaned with isopropyl alcohol. Allow the surface to dry and spray with water. Record the Hydrophobicity classification in line with STRI guide for Hydrophobicity classification. Dry the sample surface.
- ii) The sample shall be subjected to mechanical stress by bending the sample over a ground electrode. Corona is continuously generated by applying 12 KV to a needle like electrode placed 1mm above the sample surface. The test shall be done for 100 hrs.
- iii) Immediately after the corona treatment, spray the surface with water and record the HC classification. Dry the surface and repeat the corona treatment as at clause 7 above. Note HC classification. Repeat the cycle for 1000 hrs. or until an HC of 6 or 7 is obtained. Dry the sample surface.
- iv) Allow the sample to recover and repeat hydrophobicity measurement at several time intervals. Silicone rubber should recover to HC 1 - HC 2 within 24 to 48 hours, depending on the material and the intensity of the corona treatment.

4 Chemical composition test for Silicon content:

The content of silicon in the composite polymer shall be evaluated by EDX (Energy Dispersion X-ray) Analysis or Thermo-gravimetric analysis. The test may be carried out at CPRI or any other NABL accredited laboratory.

11KV 45KN Polymeric Disc Insulator B&S Type



GUARANTEED TECHNICAL SPECIFICATIONS

S. No.	DESCRIPTION	VALUE	UCM
A. DIMENSIONS			
01	CREEPAGE DISTANCE (mm.)	320	mm.
02	DRY ARC DISTANCE (mm)	170	mm.
03	SECTIONAL LENGTH	270 ± 10	mm.
B. ELECTRICAL CHARACTERISTICS			
01	NOMINAL SYSTEM VOLTAGE	11	kV
02	MAX. SYSTEM VOLTAGE	12	kV
03	SYSTEM FREQUENCY	50	Hz.
04	WITHSTAND VOLTAGE LEVELS		
	a. P.F. DRY (1 min.)	65	kV(rms)
	b. P.F. WET (1 min.)	45	kV(rms)
	c. LIGHTING IMPULSE	110	kVp
	d. RIV at 1 MHz when energized 10kV (rms) under dry condition	<100	µV
C. MECHANICAL CHARACTERISTICS			
01	a. TENSILE min.	45	kN
	b. Routine	22.5	kN
D	Weight (min)	0.750	Kg

APPLICABLE STANDARDS

- * INSULATOR :- IEC : 61109-2008
- * GALVANIZATION :- IS : 2633-1986
- * END FITTINGS :- IS : 2486-1989

TOLERANCE

- * $\pm (0.04 \times d + 1.5)$ mm when $d \leq 300$ mm.
- * $\pm (0.025 \times d + 6)$ mm when $d \geq 300$ mm.

TANGEDCO

TECHNICAL SPECIFICATION
11 KV 36 KN STRAIN DISC HARDWARES

STANDARD:

Except where modified by this specification the Strain Disc Hardware shall comply with the requirements of IS.2486 - Part (I & II) as amended upto date.

MATERIALS:

The materials for the strain hardware shall be such that it gives required mechanical strength with the specified dimensions. The following materials or any other materials depending upon its suitability for the strain hardware shall be used.

Mild steel (Sec. Schedule II of IS.1570/1961). Forged steel (Sec.IS.2107/1962 and IS.2108/1962). Malleable cast Iron (Sec.IS.2107/1962 and IS.2108/1962).

Aluminium Alloy (for clamps only). The composition of alloy shall be declared by the manufacturer giving reference to the relevant Indian Standard.

NUTS:

All nuts shall be of materials conforming to Clause 4.8. of IS.1367/1967 with regard to its mechanical properties.

COTTER PINS:

The Split cotter pins shall be made of Brass, conforming to IS410/1977, phosphor bronze conforming to IS 7814/1975, Stainless steel conforming to IS 5522/1992

SECURITY CLIPS:

The W type Security clips shall be of Phosphor Bronze conforming to IS.7814/1975, Stainless Steel conforming to IS 66003/1972.

GENERAL REQUIREMENTS:

All forgings and castings shall be of good finish and free from flaws and other defects. The edges on the outside fittings, such as at the eye, clevis and holes shall be rounded and smooth.

All parts of different fittings which provide for interconnection shall be made such that sufficient clearance is provided at the point of connection to ensure free-movement and suspension of the insulator string assembly. Ball and clevis connection shall be free in this manner but care shall be taken that too much clearance between eye and tongues of the clevis are avoided.

Suspension clamps shall be so designed that they withstand effects of vibration, both on the conductor and the fittings itself. Sharp radius of curvatures, ridges etc., which might tend to localize pressure or damage the conductor in service shall be avoided. The clamp shall permit the conductor to slip before the failure of the conductor occurs. The fittings shall have sufficient contact surface to minimize damage due to fault currents.

GALVANISING:

All ferrous fittings and the parts other than those of stainless steel shall be galvanised after all threads has been cut by hot dip process in accordance with the requirement of ISS.2633/1972 with subsequent amendments thereof and with zinc conforming to grade Zn.98 of IS.289/1960 with subsequent amendments thereof, to prevent corrosion and shall not adversely effect the mechanical properties of the coated metal. It shall consist of a smooth and continuous coating. Small fittings like spring washers etc. may be electro galvanized.

CLAMPS:

The clamps with socket shall be suitable for

- a) ACSR Raccoon conductor of sizes 6/4.09mm + 1/4/.09mm
- b) ACSR Dog conductor of size 6/4.72mm +7/1.57mm.

To avoid bimetallic action with ACSR Conductor, suitable aluminium liners shall be provided for clamps of materials other than of aluminium alloy.

CROSS ARM STRAPS:

The cross arm straps shall be suitable for 100 MM channel and shall have appropriate dimensions as per fig.26 of IS.2486 (Part-II)/1989 with subsequent amendments thereof.

BALL AND CLEVIS:

The pin balls shall be the 16mm, type as per fig.8 of IS.2486 (Part-II)/1989

The clevis shall be as per fig.34 of IS.2486 (Part-II)/1989 and shall suit the above cross arm straps.

The clearance between pin ball and socket end will be as per fig.21 for 16mm, alternative "B" furnished in IS.2486 (Part-II)/1989.

The dimensions of the pin balls will be 16mm, as per fig.8 and the dimension of the socket as per fig.9 for 16mm, alternative "B" furnished in IS.2486 (Part-II)/1989).

The effectiveness of locking the pin ball will be as per fig.22 for 16mm, alternative "B" and sliding position of the pin ball in the socket and as per fig.23, 16mm, alternative "B" of IS.2486 (Part-II)/1989.

The materials for the "W" type security clip, split pins, retaining bolts etc. shall be as per IS.2486 (Part-II)/1989.

CLAMP SOCKET:

The clamp socket shall be 16 mm, alternative "B" type as per fig.9 of IS.2486 (Part- II)/1989.

STRAIN HARDWARE ASSEMBLY:

The assembled strain hardware shall have dimensions as per IS 2486 (Part-II)/1989 and shall be suitable for use with the standard type of ball and socket type 11 KV Strain Disc Insulators.

A sample 11 KV Strain Disc Insulator of the Ball and Socket type for which the hardware are required shall be made available to the tenderer on demand and payment of appropriate cost of insulator.

ULTIMATE STRENGTH:

The ultimate strength of the assembled strain hardware shall not be less than **36 KN** **(Strain hardware suitable for Dog and Raccoon conductor)**

INTERCHANGEABILITY:

All similar components and removable parts shall be interchangeable.

TESTS AND TEST CERTIFICATES:

Following tests shall be conducted and test certificate duly signed by a responsible officer of the manufacturer shall be submitted:

- a. Visual Examination
- b. Verification of Dimension
- c. Galvanizing / Dip Test
- d. Slip Strength Test
- e. Mechanical Load Test
- f. Chemical Analysis Test
- g. Electroplating/Micron Test

ACCEPTANCE TESTS AND ROUTINE TESTS:

The Routine test: As per clause 7.3.3. of IS. 2486 (Part-I) 1993 with subsequent amendments thereof shall be conducted by the manufacturer on finished goods before offering for inspection.

The routine test certificates furnishing the above test results shall be submitted in duplicate to concern authority along with the inspection call for approval before actual despatch of each consignment.

PACKING:

For packing, wooden cases shall be employed. The packing shall be fit to withstand rough handling while loading and unloading and also during transit to destination. The threaded portions of the fittings shall be properly protected against similar damage as above by providing protective caps. The gross weight of the packing shall not normally exceed 50 Kgs. Different fittings shall be packed in different cases and shall be complete with their minor accessories fitted in place. All nut shall be hand tightened over the bolts and screwed upto the farthest points.

DRAWINGS:

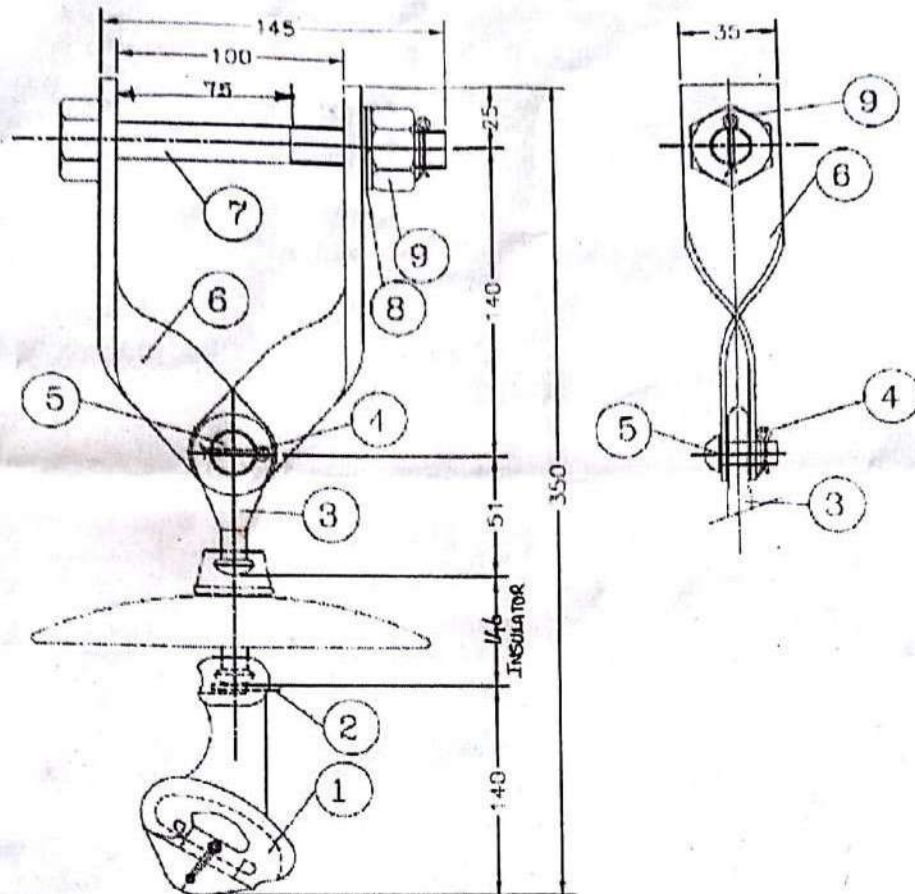
The Tenderer shall submit 2 copies of drawing of 11 KV 36KN Strain Disc Hardwares suitable for Dog & Raccoon conductors, showing the construction details, physical dimensions such as standard type of steel, ball and clevis and clamp with socket, twisted straps etc.

GUARANTEED TECHNICAL PARTICULARS:

The guaranteed technical particulars shall be furnished conforming to IS.2486 (Part I and II) /1989 with subsequent amendments thereof.

GUARANTEED TECHNICAL PARTICULARS
11 KV 36KN STRAIN DISC HARDWARES

Sl. No	PARTICULARS		GUARANTEED VALUES
1.	Makers name & full address	:	
2.	Mechanical Strength	:	36KN
3.	Whether Hot Dip Galvanized	:	YES
4.	Packing arrangements	:	20Set's Packed in One Gunny Bag
5.	a) Thickness of spring washer b) Thickness of hexagonal nut	: :	3MM Minimum12MM – Maximum 13MM
6.	Whether the drawing is enclosed as per Specification.	:	YES
7.	Material of clamps	:	Aluminium Alloy
8.	Whether the material conform to the Specification	:	YES
9.	Weight of complete set of Hardware	:	36KN - 1.40 Kg (Approx)
10.	Tolerance in weight and dimensions.	:	Plus or Minus 5% Both Dimension & Weight



9	HEX.NUT TO SUIT M16 BOLT AND TH. OF NUT AS PER IS:1364 16MIN-11.9&MAX-13.0mm	M.S. E.G
8	SPRING WASHER TO SUIT16 DIA.BOLT(TH-3mm)	M.S. E.G
7	ROUND NECK HEX HD.BOLT (16mm DIA)	M.S. E.G
6	TWISTED STRAPS (35 x 6mm)	M.S. H.D.G
5	RETAINING BOLT TO SLOT HOLE DIA.10mm	DROP FORGED STEEL
4	SPLIT PIN (4mm DIA))	BRASS
3	BALL CLEVIS/EYE	MALLEABLE C.I
2	'W' TYPE SECURITY CLIP	PHOS.BRONZE
1	'U' BOLTED TYPE STRAIN CLAMP WITH SOCKET WITH SUITABLE FOR A.C.S.R CONDUCTOR OF SIZE 6/4.72mm to 7/1.57mm	ALALLOY
S. NO.	DESCRIPTION	MATERIAL

NOTE-

- 1) ALL DIMENSIONS ARE IN MM.
- 2) ALL FERROUS PARTS TO BE HOT DIP GALVD.
AS PER IS: 2633
- 3) HARDWARE SHALL BE GENERAL ACCORDANCE
WITH IS: 3486
- 4) GENERAL TOLERANCE $\pm 5\%$
- 5) SLIP/MECHANICAL STRENGTH OF TENSION CLAMP
95% OF UTS F RELEVANT CONDUCTOR
- 6) ULTIMATE ASSEMBLY STRENGTH $\geq 36KN$

Superintending Engineer
Materials Management-I

TANGEDCO

SCALE	1:1. NTS	DATE
DRAWN		
CHKD.		
APPVD.		
DRG. NO.		REV
		0

TITLE-

GA. DRAWING OF
11KV STRAIN DISC HARDWARE
SUITABLE FOR DOG AND RACCOON

SPECIFICATION FOR 9 KV, 5 KA DISTRIBUTION TYPE METAL OXIDE LIGHTNING ARRESTERS POLYMERIC HOUSED WITHOUT GAPS FOR AC SYSTEMS:

1. PURPOSE:

The polymeric housing Lightning Arresters (Distribution type) are required to be used to protect the 11 KV Distribution Transformers from high transient voltage (surge) in a three phase solidly earth neutral system. These Lightning Arresters will be connected between phase and earth just before the transformers H.V. Bushings.

The 9 KV, 5 KA Lightning Arresters shall possess the following electrical and physical characteristics.

ELECTRICAL:

- (i) Voltage : 9 KV
- (ii) Frequency : 50 HZ
- (iii) Nominal Discharge Current : 5 KA

2. SERVICE CONDITIONS:

The Surge arresters with Disconnectors and accessories shall be suitable for continuous, satisfactory operation under climatic conditions listed below: -

- 1. Maximum ambient air temp. (°C) : 50
- 2. Minimum ambient air temp. (°C) : 3.5 in shade
- 3. Humidity (%) : 10 to 100
- 4. Maximum altitude above mean sea level: 1000 (Meter)
- 5. Maximum annual rainfall (mm) : 1450
- 6. Maximum wind pressure (kg/Sq.Mtr.) : 150
- 7. Isoceraunic level : 50
- 8. Seismic level (Horizontal accn.). : 0.3 g
- 9. Moderately hot and humid tropical Climate, conducive to rust and fungus growth.

3. DEFINITIONS:

LIGHTNING ARRESTER:

A device designed to protect electrical apparatus from high transient overvoltages.

GAPLESS METAL-OXIDE LIGHTNING ARRESTER:

A Lightning arrester having one or several non-linear metal-oxide resistors with highly non-linear voltage-current characteristics, connected in series, but having no integrated series or parallel spark gaps.

POLYMERIC HOUSED LIGHTNING ARRESTER:

A lightning arrester with a housing made of polymeric material without air Voids neither between the housing and the metal-oxide resistors nor the housing itself. Arresters must have directly moulded housings. Arresters manufactured by slip-on, pre moulded housing will not be accepted in view of the weak interface between the housing and the assembled disc.

SHORT CIRCUIT TEST / MODE OF FAILURE PERFORMANCE:

Behavior of the arrester during and after a simulated internal failure with different power frequency short circuit currents.

BONDING BETWEEN HOUSING AND METAL-OXIDE RESISTORS/INTERFACIAL SEALING:

The adhesion between the polymeric housing and the metal-oxide resistors or any other metallic or non-metallic parts inside the housing must be strong enough, homogeneous, robust and resistant to thermal cycles and environmental stresses.

4. **PHYSICAL:**

The 9KV polymeric housing Lightning Arresters should be of Single Pole, Outdoortype suitable for use in A.C. three phase 11 KV, 50 Hz & effectively earthed neutral system respectively and for application at altitudes upto 1000 metres.

They should be suitable for operation in tropical and humid climates for a temperature variation from 5 Degree Celsius to 65 Degree Celsius and for relative humidity as high as 100%.

5. **LIST OF STANDARDS:**

1. IEC-99-4/1991 Specification for Surge arresters without gap of A.C.system.
2. IS-3070 Specification for Lightning Arresters (Part-1)/1985 for Alternating Current Systems &(Part-3)/1993.
3. IS-4759/1996 Hot dip zinc-coating on structural steel and other allied products.
4. ISS-2633/1986 Method for testing uniformity of coating on zinc coated articles.
5. ISS-13947/1993 Degree of protection provided by (Part-I) enclosures for low voltage switch gear and control.
6. Indian Electricity Rules 1956.
7. IEC 60099 – Part 4 & Part 5: **Metal-oxide surge arresters without gaps for a.c. systems.**

The housing shall conform to the degree of protection as per IP53 (IS

1394part-I, 1993).

6. **SYSTEM PARAMETERS:**

The Lightning arrester must be able to operate under the system parameters mentioned in this specification.

Nominal System Voltage	: 11 KV
Frequency	: 50 Hz
Grounding of Neutral	: Solidly
Temporary Overvoltage (Earth Fault Factor)	: 10.4 KV for 10 sec. :12KV
Highest System Voltage	:20KA
Short Circuit Levels	:75KV
Insulation Withstand Level (BIL)	

7. **PRODUCT REQUIREMENTS:**

POLYMERIC HOUSING MATERIAL:

The polymer material which is used for the arrester housing must be tracking and erosion resistant, stabilized against UV radiation in similar applications (like MV/HV cable terminations, insulators and arresters) in country.

HOUSING AND MECHANICAL REQUIREMENTS:

The Lightning arrester shall meet the following specifications: Creepage Length : 300 mm (min.)

Pull Strength : 1000 N (min)

Cantilever Load : 75 Nm (min)

Torsion : 30 Nm (min)

ELECTRICAL REQUIREMENTS:

The Lightning arrester shall meet the following specifications based on IEC60099-4 :

Arrester Max. Cont. Operating Voltage U_c : 7.65 KV

rms Arrester Rated Voltage U_r : 09 KV rms

Nominal Discharge Current I_n : 5 kA p

Long Duration Discharge Class : **75A, 1000 μ s**

Max. Residual Voltage @ I_n : 30 kVp

Lightning Impulse 1.2/50 μ s Withstand Voltage: 75 KVp

Wet Power Frequency Withstand Voltage : 28 KV rms

ACCESSORIES & MOUNTING:

The mounting accessories shall be designed arresters shall be suitable for vertical and horizontal mounting fixed in Channel of size 75 x 40, 100 x 50 & 125x 65 mm and hence they should be suitable for bracket mounting.

The Lightning Arresters should be designed so that in case of its total failure, it should not shatter and damage the nearby equipments. They may be provided with the following:

- a) Adjustable mounting bracket so as to enable it to be fixed in any of the channels with bolts & nuts with spring washer and ordinary washers.
- b) The line and earth terminals should be designed to accommodate 7/2.59mm ACSR Conductor / 7/3.15 mm AAAC Conductor and there should not occur any bimetallic action. The fasteners used should be " Self Locking " type.

DISCONNECTORS:

The earth end shall get connected to the earth terminal of the arrester through disconnector. The function of the disconnector is that in the event of, operation of surge arrester, the current shall pass to earth and the disconnector shall disconnect (isolate) the earth terminal and it shall remain suspended on the mounting of the arrester. There by it will be disconnected from the earth and shall provide visual indication to the patrolling personnel. The line can be recharged without isolating the damaged arrester. The arrangements of disconnector is to be submitted along with tender document.

CORROSION PROTECTION:

The arrester and all its accessories shall be adequately protected against corrosion. All exposed ferrous components, unless of stainless steel or other non- corrosive metal, shall be hot-dip galvanized. Hardware shall be of stainless steel.

8. TESTING :

The arresters shall be tested in accordance with the following latest standards-IEC 60099-4/ 2004-05 Standard.

LOCATION OF TESTS:

Routine tests and acceptance tests shall be carried out at the supplier's factory. Type tests shall be carried out in the laboratories of an NABL accredited independent test institute/ Govt. approved lab. Relevant type test certificates are mandatory and shall be issued by the NABL accredited independent institute/Govt. approved lab.

TYPE TEST FOR ARRESTERS WITH POLYMERIC HOUSING:

All the tenderers must submit copies of type test certificates along with laboratory approved drawings for the products offered by them. Type tests should be carried out in accordance with the latest version of specified standard at Govt. approved / NABL accredited lab and test reports should be enclosed on date of opening the tender. Surge arresters offered shall be manufactured with the same configuration & raw materials as used in the surge arrester for which type test reports are submitted.

- a. Insulation Withstand Test on Arrester Housing
- b. Residual Voltage Tests
- c. Long Duration Current Impulse Withstand Test
- d. Operating Duty Test
- e. Partial Discharge Voltage Test
- f. Accelerated ageing test

- g. Power frequency voltage versus time characteristics
- h. Weather Ageing Test
- i. High current short circuit test for 20KA
- j. Low Current short circuit test for 600A
- k. Test on Arrester Disconnecter
 - 1. Time Vs Current Test for disconnector
 - 2. Long duration current impulse test on disconnector
 - 3. operating duty test on disconnector.

The arrester shall prove its resistance against pollution by passing following type test:- 1000hrs salt fog test at maximum continuous operating voltage U_c applied.

l. Short Circuit Test/Mode of Failure Test

The arrester shall prove its withstand capability with respect to internal failures by passing the following type tests:

Short Circuit Test in accordance with IEC 60099-4/2004-05 Standard. procedures shall be used for testing.

The minimum symmetric fault current shall be 20KA rms for a minimum of 0.2s for high current short circuit test.

The fault current shall be initiated preferably by prefailing the arrester within 5 ± 3 minutes with a power frequency AC voltage.

For low current short circuit test, the test shall be performed Specification for Polymeric Surge Arresters by over voltage method.

During the test no parts must be ejected and the arrester has to maintain its integrity. All flames must self extinguish within one minute after the test.

ROUTINE TESTS:

The manufacturer shall carry out the following routine tests on each single arrester in accordance with IEC 60099-4/ 2004-05 Standard.

- AC Reference Voltage Test (final arrester)
- Partial Discharge Test (final arrester including hardware/accessories)
- Residual Voltage Test (final arrester or metal-oxide resistors)

The manufacturer shall provide a routine test report including all relevant details with respect to the test limits. On request, the manufacturer shall also provide a routine test protocol including all measuring results.

Sample test are not acceptable.

ACCEPTANCE TESTS:

The acceptance tests shall be carried out as per IEC: 60099-4/ 2004-05 standard.

1. Power frequency reference voltage test
2. Lightning impulse residual voltage test
3. Internal partial discharge test
4. Visual examination & Dimensional verification

Test Certificate:

Routine Test , acceptance test and optional tests as per IEC: 60099-4/2004-05 standard with its latest amendments shall be conducted using testing kit/ equipment / instruments calibrated in any of the Government Institute / Undertaking / Government Recognized Laboratory.

The test results shall be furnished to the Chief Engineer/
Distribution, Tirunelveli, Maharajanagar – 627 011 for approval.

9. MARKING:

Each arrester shall be provided with a nameplate, bearing the following information, as a minimum, in English language:

- Arrester Type
- Continuous Operating Voltage U_c
- Rate Voltage U_r
- Nominal Discharge Current
- Manufacturers name or trademark
- Month & Year of manufacture
- **PROPERTY OF TANGEDCO**

10. DRAWINGS:

The tenderer shall furnish catalogues, literature and detailed dimensional drawings of complete arrester with disconnector showing clearances, polymer housing details & name plate details.

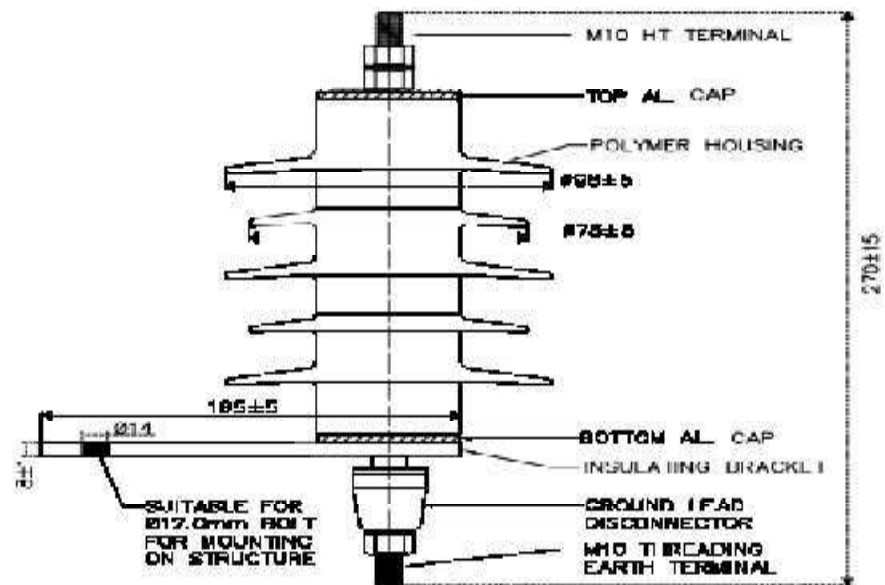
11. QUALITY ASSURANCE:

The manufacturer shall be certified in accordance with ISO 9001. The supplier has to provide a copy of a valid certificate along with his quote. Relevant manual shall be presented upon request.

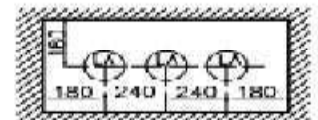
12. PACKING AND SHIPMENT:

Arresters shall be securely packed, complete with all accessories, in

strong non-returnable boxes, in such a manner as to prevent damage during shipment.



INSULATING DRACKET/
MOUNTING BRACKET



MINIMUM CLEARANCE FROM
EARTHED OBJECTS AND PHASES

TITLE:
9KV 5KA DISTRIBUTION TYPE
POLYMERIC LIGHTNING ARRESTER WITH
DISCONNECTOR

TANGEDCO

TECHNICAL SPECIFICATION

GI HT Tapping Channel X arm, Top Insulator Fitting and Back Clamp

Standards:

This specification governs the supply of GI HT Tapping Channel X arm, TI Fittings and Back Clamp. The raw materials for the manufacturing of these line materials are to be conformed to IS2062-1992 (Grade A) and the fabrication shall conform to IS 7215-1974, Tolerances for fabrication of steel structures are as amended upto date.

General Requirements:

- 1) The GI HT Tapping Channel X arm to be supplied should conform to the dimension and weight specified in the drawing furnished in Annexure for GI HT Tapping Channel X arm **(100X50mm X 6mm size channel). Finished weight for 11KV-14.53Kg and 22KV- 15.77Kg.**
- 2) The GI HT Top Insulator Fitting to be supplied should conform to the dimension and weight specified in the drawing furnished in Annexure for GI HT TI Fitting **(100X50mm size channel & 65X65x6 Size Angle). Finished weight for 3.00 Kg.**
- 3) The GI Back Clamp to be supplied should conform to the dimension and weight specified in the drawing furnished in Annexure for GI Back Clamp **(50X8mm size Flat). Finished weight for 1.40 Kg.**

Galvanizing:

- 1) The contractor should galvanize the Line materials in accordance with IS :2629-1966 and IS:4759-1968 with hot DIP process.
- 2) The black materials may be prepared suitably prior to galvanization as per Indian Standard practice IS:6159-1971.
- 3) Zinc conforming to Grade Zn98 specified in IS:209-1966 should be used for the purpose of galvanizing.
- 4) The molten Zinc in the galvanization bath shall contain not less than 98.5% by weight of Zinc and Aluminium content of the bath during galvanization operation shall not exceed 0.01%.

5) Thickness of Zinc coating shall not be less than 86microns for iron and steel fabricated articles of 5mm thick and above. Zinc coating should be adherent, smooth, continuous and uniform. Ther should be free from imperfections such as lumps, bisters, uncoated area/spots, blackspots, flux ash and dross inclusions.

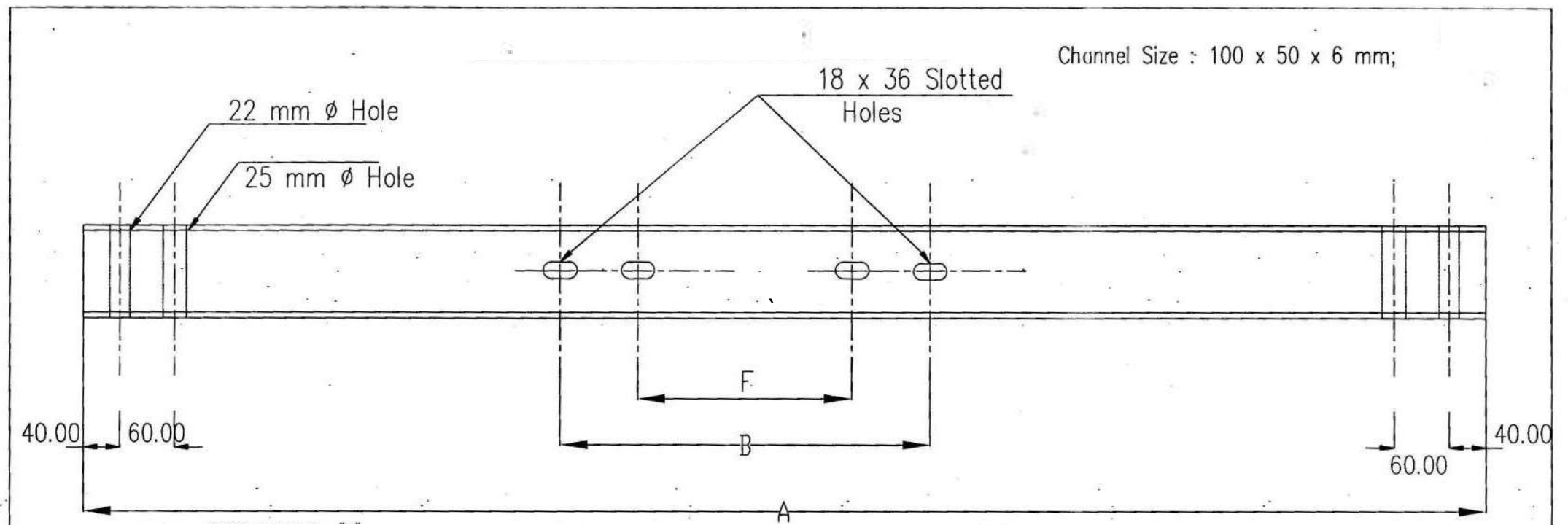
6) Adherence of Zinc coating may be determined by cutting or prying withstout knife test in a manner to remove a portion of coating with considerable pressure. Thickness of coating may be determined by magnetic or eddy current or microscopic method as per IS:3203-1965.Whereas practicable uniformity or galvanized coating should be determined by precce test as per IS:2633-1964,the coating should withstand pivoted hammer and knife test for Adherence testing of Zinc coating as per IS:2629- 1966.

Test Certificates:

Dimensions for MS Channels, MS Angles, MS Flats shall be in accordance withdrawing enclosed and all ferrous parts shall be **Hot Dip Galvanized as per relevant IS.**

Following tests shall be conducted and test certificate duly signed by a responsible officer ofthe manufacturer shall be submitted:

- a. Verification of Dimension
- b. Dip Test/Galvanizing Test
- c. Mass of Zing Coating Test
- d. Chemical Test
- e. Mechanical Test



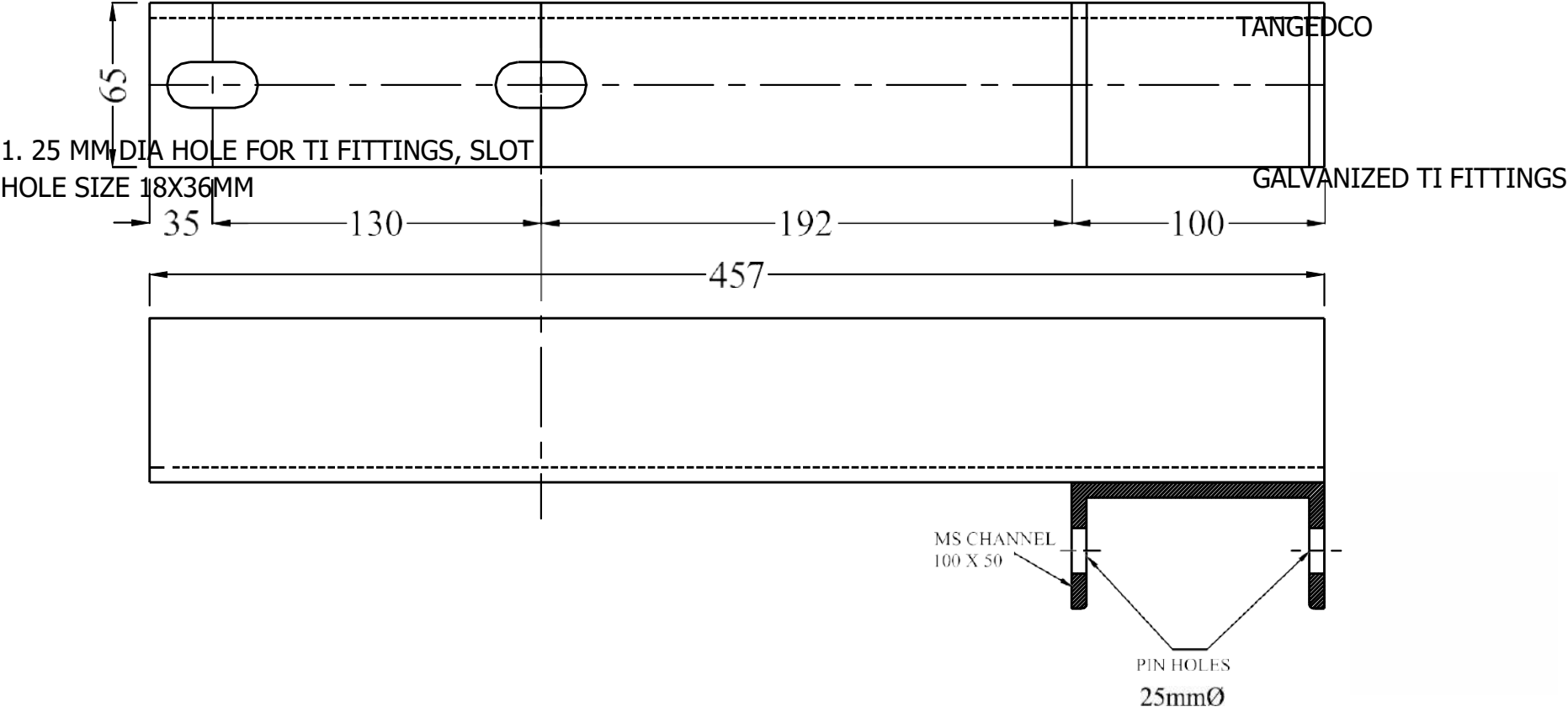
Sl.No	Description	A	B (9.0m PSC)	F
1	11 KV	1520	320	180
2		1650	320	180

GALVANIZED TAPPING CHANNEL CROSS ARM

ALL DIMENSIONS ARE IN MM

FINISHED WEIGHT 9.0M PSC
POLE 11KV - 14.53KGS, 22KV -
15.77KGS

GALVANIZED
TOP INSULATOR FITTINGS

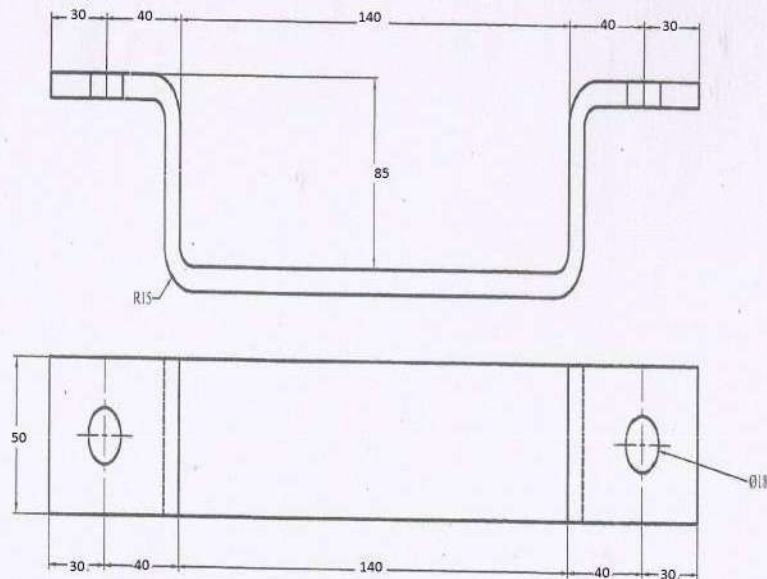


NOTE:

2. MS Angle ISA 65X65X6, IS: 2062 Gr.A, Length 457 mm
3. MS Channel ISMC 100X50, IS:2062 Gr.A, Length 65 mm
4. Weight 3.00 kgs per No.
5. Not to scale
6. All dimensions are in mm

SCALE NTS		TITLE:		
PREPARED	CHECKED	APPROVED	REF:	REV:

GALVANIZED BACK CLAMP FOR TAPPING CHANNEL CROSS ARM

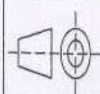


NOTE:

1. Material : M.S.Flat 50 X 8 of IS:2062 Gr.A
2. Ckt Length of flat 450mm
3. Finished product weight 1.4 kgs
4. Round holes of size 18 mm Dia 2 Nos
5. All dimensions are in mm

SCALE

NTS



TANGEDCO

ORD BACK CLAMP FOR
TAPPING CHANNEL X ARM
(SUITABLE FOR 9MTR SQUARE PSC POLE)

TECHNICAL SPECIFICATION
GALVANIZED STAY SET COMPLETE

1.0 STANDARDS

This Specification governs the supply of stay set complete. The raw materials for the manufacturing of these line materials are to be conformed IS 2062-1992 (Grade A) and the fabrication shall conform to IS-7215-1974, Tolerances for fabrication of steel structures and as amended upto date.

GENERAL REQUIREMENTS:

The stay set complete to be supplied should conform to the dimension and weight specified in the drawings furnished in Annexure for stay set complete

A tolerance of plus or minus 5% in the weight of Nos line material will be allowed subject to the material supplied being found to conform to the dimensions stipulated and also suitability for use in works.

The welding should be of required strength and to be done evenly wherever necessary.

The supplier should have adequate manufacturing and testing facilities for the line materials proposed to be ordered.

Galvanizing

1) The contractor should galvanize the Board's black tower materials, Line materials and other black materials in accordance with IS: 2629 - 1966 and IS:4759-1968 with Hot Dip process.

2) The black materials may be prepared suitably prior to galvanization as per Indian standard practice IS:6159 -1971.

3) Zinc conforming to Grade Zn98 specified in IS:209 -1966 should be used for the purpose of galvanizing.

4) The molten zinc in the galvanization bath shall contain not less than 98.5% by weight of zinc and Aluminium content of the bath during actual galvanization operation shall not exceed 0.01%.

5) Thickness of zinc coating shall not be less than 86 microns for iron and steel fabricated articles of 5 mm thick and above. Zinc coating should be adherent, smooth, continuous and uniform. There should be free from imperfections such as lumps, blisters, uncoated area/spots, black spots, flux ash and dross inclusions.

6) Adherence of zinc coating may be determined by cutting or prying with stout knife test in a manner to remove a portion of coating with considerable pressure. Thickness of coating may be determined by magnetic or eddy current or microscopic method as per IS:3203-1965. Whereas practicable uniformity of galvanized coating should be determined by Preece test as per IS:2633-1964, the coating should withstand pivoted hammer and knife test for Adherence testing of Zinc coating as per IS:2629- 1966.

The line materials should be suitably packed to avoid damage during transport.

INSPECTION:

TANGEDCO reserves the right to depute a representative for inspecting the manufacturing process at Company's works. Necessary facilities for such inspection shall be provided.

The materials will be inspected at ex-works and at the time of erection at site and if defects are noticed at either stage, the materials are liable for rejection. The supply will also be rejected if the line materials ordered, do not conform to the relevant drawing and in the opinion of the Inspecting Officer are found not suitable for the purpose for which they are intended.

Test Certificates:

Dimensions for MS Channels, MS Angles, MS Flats shall be in accordance with drawing enclosed and all ferrous parts shall be **Hot Dip Galvanized as per relevant IS.**

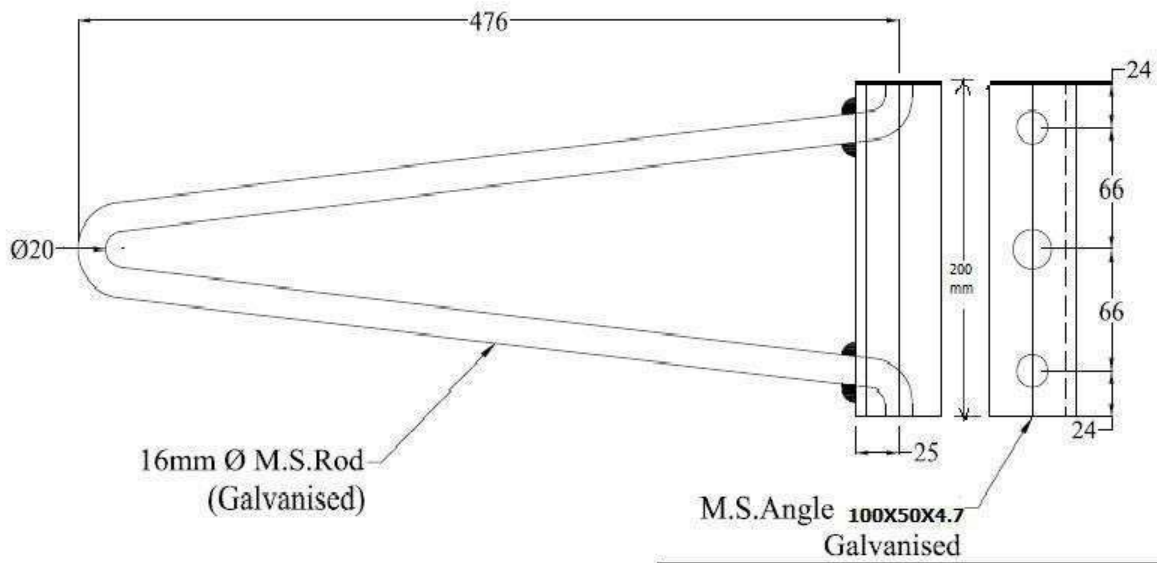
Following tests shall be conducted and test certificate duly signed by a responsible officer of the manufacturer shall be submitted:

- a. Verification of Dimension
- b. Dip Test/Galvanizing Test
- c. Mass of Zinc Coating Test
- d. Chemical Test
- e. Mechanical Test

Description of line materials

Sl. No.	Description of Materials	Qty	Description of Raw material	Weight in Kg
1.	GI Stay set complete	1 set		
	a. Eye Bolt	1 No.	MS Rod 20 mm	9.0
	b. Stay hook/Bow	1 No.	MS Rod 16 mm	
	c. Stay Rod	1 No.	MS Rod 20 mm	
	a. GI washer	1 No.	50 x 50 x 1.6 mm	
	b. GI Hexagonal nut	1 No.	To suit the stay rod	

GI Stay Hook

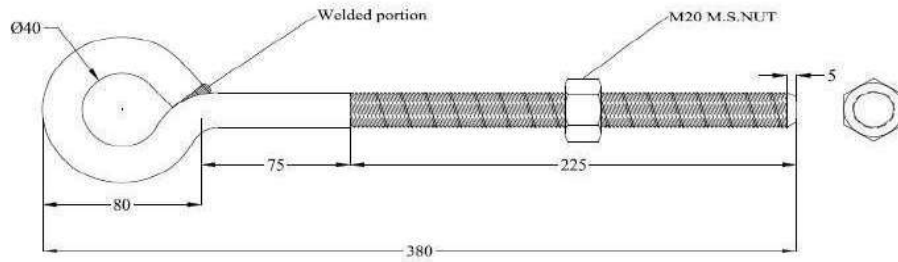


NOTE:

1. M.S Rod ISRO 16 mm Ø, M.S.Angle 100X50X4.7
2. Length of Rod 995 mm
3. Length of angle 200 mm
4. Qty - 1 No per set.
5. Large round Hole 22 mm Ø and small round Hole 18 mm Ø
6. Not to scale
7. All dimensions are in mm

TANGEDCO METTUR WORKSHOP CIRCLE METTUR DAM-I.				
SCALE NTS		TITLE: STAY HOOK		
PREPARED	CHECKED	APPROVED	REF:	REV:

GLEYE BOLT

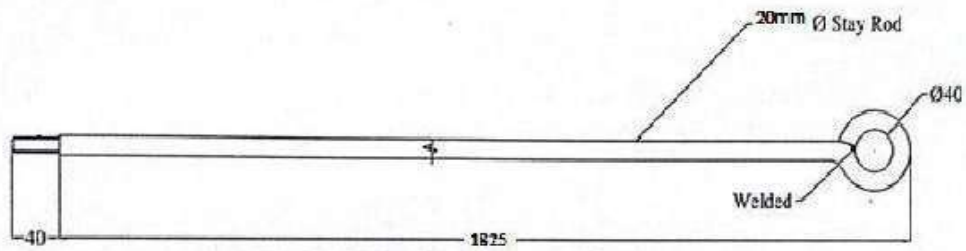


NOTE:

1. MS rod ISRO 20 IS:2062 Gr.A, Length 465 mm
2. Weight of Rod 1.15 kg & Nut 0.056 kg Qty : 1 No. per set
3. Thread should be suitable for standard M20 Nuts
4. Not to scale
5. All dimensions are in mm

TANGEDCO METTUR WORKSHOP CIRCLE METTUR DAM-I,				
SCALE NTS		TITLE: EYE BOLT		
PREPARED	CHECKED	APPROVED	REF:	REV:

GI Stay Rod

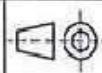


Note:

1. Materials M.S.Rod **20 mm Ø**
2. Length of M.S.Rod **2130 mm**
3. Weight of Stay Rod **5.04 kgs**
4. All dimensions in mm
5. Dimensions Not to scale
6. Along with 50x50x1.5 mm washer and suitable Nut.

TANGEDCO
METTUR WORKSHOP CIRCLE
METTUR DAM-I.

SCALE
NTS



TITLE:

STAY ROD

PREPARED

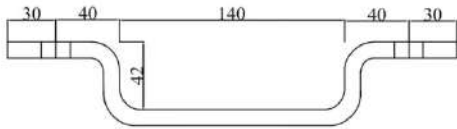
CHECKED

APPROVED

REF:

REV:

GALVANIZED STAY CLAMP



- Note:**
- 1. All Dimensions are in mm
 - 2. Clamp made by 50 x 10 mm Flat
 - 3. Holes are 18 mm Dia
 - 4. Finished Weight 1.400 Kgs. per No.
 - 5. Quantity - 2 set (4 nos)

GALVANISED STAY CLAMP		
TANGEDCO		
DRAWN		DRG.NO.
CHKD.		
APPVD.		NTS REV 0

TECHNICAL SPECIFICATION **FOR GI EARTH WIRE 8 SWG**

1.0 STANDARD WIRE SIZE WITH DESCRIPTION (8 SWG)

4 mm Galvanized Iron Solid Wire Heavily Zinc coated conforming to IS.4826 and IS 280 (as amended upto date) in all respects.

2.0 APPLICABLE STANDARDS

Unless otherwise stipulated in this Purchase Order the contractor shall comply with IS.4826 and IS 280 or the latest version thereof.

3.0 PROPERTIES OF SOLID WIRE

The properties of the Solid Wire used should conform to the relevant IS, in all respects. It should have a minimum tensile strength of 55 to 95 Kgf/Sq.mm.

4.0 FREEDOM FROM DEFECTS

The solid wire shall be smooth and free from all imperfection such as split etc.

5.0 JOINTS IN SOLID WIRE

There shall be no joint in any wire of a ordered Solid Wire.

6.0 SOLID WIRE

The Steel Wires used in the construction of a Solid wire shall satisfy all the relevant requirements of this standard.

7.0 TESTS

When desired by the Purchaser random samples will be taken and it will be subjected to all relevant tests as per ISS mentioned above. The wires used shall comply with the following tests as per IS.4826 and IS 280 of latest issue.

TEST CERTIFICATES

The material should confirm to IS 4826 and IS 280 as amended up to date and tensile strength of 55 to 95 Kgf/ sq .mm (with elongation as per Grade -III).

TECHNICAL SPECIFICATION

7/11 SWG G.I Stranded Wire

STRANDED WIRE SIZE WITH DESCRIPTION

7/11 SWG Galvanized Iron stranded wire Heavily Zinc coated shall conforming to IS.2141 of 1979 (as amended upto date) and IS4826/1979 in all respects.

APPLICABLE STANDARD

Unless otherwise stipulated in this purchase order, the contractor shall comply with IS.2141 of 1979 or the latest version and hot dip galvanized coating shall conform to IS4826/1979 with amendments upto date.

PROPERTIES OF STRANDED WIRE

The properties of the stranded wire used should conform to the relevant IS, in all respects. It should have a minimum tensile strength of 70 Kgf/sqmm.

FREEDOM FROM DEFECTS

The stranded wire shall be smooth and free from all imperfection such as split etc. The zinc coating shall conform to IS4826 of 1979 (as amended upto date)

JOINTS IN STRANDED WIRE

Joints shall be permitted in the individual wires during stranding but these stranding joints shall be not less than 15 meters apart in the finished strand.

STRANDING

The steel wires used in the construction of a stranded wire shall before stranding satisfy all the relevant requirements of this standard.

TESTS

Test on wires before manufacture:

The wires shall be subjected to the following tests according to IS 2141.

1. Ductility test
2. Tolerance on wire diameter

Tests on complete strand

The wires shall be subjected to the following tests according to IS 2141.

- 1) Tensile and elongation test. Percentage elongations of stranded wire shall not be less than 6%.
- 2) Chemical analysis of sample from each lot.
- 3) Galvanizing test: The zinc coating shall conform to heavy coating and number of dips specified in IS - 4826/1979.

The uniformity of zinc coating shall be tested by the method specified in IS – 2633-1964.

The samples of individual wires for the test shall normally be taken before stranding. However when desired by the purchaser the test samples may be taken from the stranded wire. Test certificate as per relevant ISS should be submitted for approval.

PACKING

The packing shall conform to relevant packing standards. The contractor should however ensure that the packing is such that the materials reach their destinations without damages or loss after transport by road or rail. The words 'Handle with care' should be printed in the cover. A test certificate duly indicating the test values shall be submitted

➤ **Note: The GI Stranded Wire both the end terminals shall be clamped / tightened by end caps to avoid uncoiling while transit & storage.**

TECHNICAL SPECIFICATION

Supply of LT Protection Kit

The brief Technical particulars of various components to be offered are as here under.

1) A typical drawing No detailing the LT Fuse kit to be offered is annexed. It is clarified that the dimensions regarding mounting and conductor size are bunking. The other dimensions are indicative. The fittings shall be assembled in accordance with the manufacturer's recommendations on conductors of size and type with which it is to be used. The Fuses shall be as per relevant standards.

2) **1.1KV pin insulators:** These shall conform to IS-1445/77 and baked in temperature controlled kiln only. They should be brown glazed. The pin insulators shall be in conformity with fig. 1 of IS -1445 /77 and with threaded forged GI Pins. The profile of threads being as given on fig.5 of IS-1445/77.

3) The insulator shall have the following Electrical & Mechanical characteristics.

a) Dry powder frequency withstand
voltage: 23KV (RMS)

b) Wet powder frequency withstand
voltage: 10KV (RMS)

c) Power frequency puncture withstand: 1.3xActual flashover voltage.

d) Maximum failing load: 366.902 Kgf.

The 1.1KV Pin Insulators used shall bear the ISI mark.

The bidders shall furnish the type test certificates of the 1.1 KV pin insulators from the recognized laboratories/Research institutes or testing house. The original certificate in all such cases shall be produced for verification.

NOTE:

Mounting frame assembled with insulators, Pad connectors shall be packed in suitable crates, Loose items such as Fish Plates, Bolts & Nuts etc., to be packed in suitable polythene bags.

Pad connectors: It shall conform to relevant IS standards.

The Fasteners used shall be galvanized.

The Materials used shall be Aluminum alloy.

All ferrous components except those made of stainless steel, shall be galvanized.

Threads of nuts and tapped holes, when cut after galvanizing shall be well oiled or greased.

The pad shall have provision to receive Fuse wire by a Brass Bolt and Nuts of size specified.

3 numbers of pad connector shall be suitable to receive PVC insulated aluminum wire of 25 to 95 sqmm.

3 Numbers of pad connectors shall be provided to receive over head bare aluminum conductor of squirrel/Weasel/Rabbit conductor.

BILL OF MATERIALS:

The Bill of materials is as indicated in the drawing.

GI Pins: The LT GI Pins used shall conform to IS-2633/10972 and IS 6745/1972. The dimension shall conform to fig.2 of IS -7935/1975 with shank length of 40mm.

Confirming to the technical specification and drawing enclosed.

SPECIFICATION

TECHNICAL SPECIFICATION FOR

SUPPLY OF LT PROTECTION KIT FOR SINGLE POLE STRUCTURE WITH LT PIN and INSULATORS AS PER SKETCH ENCLOSED AND WITH LATEST IS WITH UPTO DATE AMENDMENTS

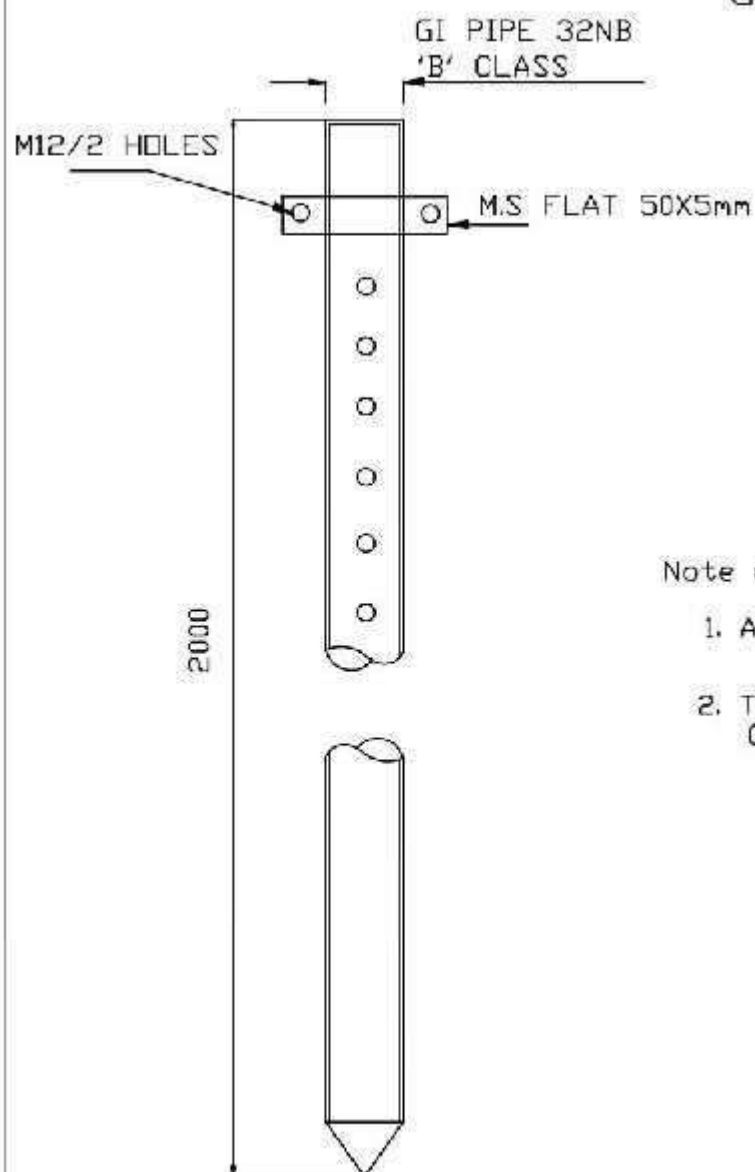
Sl. No	PARTICULARS	LT FUSE
A	<u>FOR LT FUSE</u>	
1.	Dimension of Fuse	As per drawing
2.	LT Fuse Horn with terminal connector	Al. Alloy
3.	Size of brass screw with fly nut	Ø5mmx25mmlong with flynut
4.	LT Fuse Mounting Frame	Galvanized Angle 45x45x5mm (HDG)
5.	C.Clamp	Galvanized Flat 20x3mm (HDG)
6.	Tolerance in dimension	+ or – 5%
B	<u>FOR LT PIN</u>	
7	Standard specification to which the pinshall confirm	IS 7935/1975
8	Length of Pin	175mm
9	Shank Length	40mm
10	Stalk length	135mm
11	Thickness of stalk collar	5mm
12	Diameter of Stalk	10mm
13	Diameter of stalk collar	32mm
14	Diameter of Shank	16mm
15	Length of threads at Stalk	32 +or- 3 mm
16	Length of Threads at Shank	40mm
C	<u>FOR LT PIN INSULATOR</u>	
17	Standards according to which the pininsulators are manufactured	IS-1445/1977
18	a) Type	LT Pin Type
	b) Make	Any reputed make
19	Minimum creepage distance in mm	185mm
20	Minimum Failing Load	3.5KN
21	Rated voltage(KV)	1.1KV
22	Power Frequency withstand voltage(KV rms)	
a	Dry	23KV rms
B	Wet	10KV rms
23	Power frequency puncture withstand voltage of units in KV(rms)	1.3 times of actual flashoverof unit

TECHNICAL SPECIFICATION
GI EATH PIPE 10' (40MM DIA)

Supply of good quality GI Earth Pipe Medium class 40mm dia, 3.25mm Wall thickness 2000mm length and welded with a GI Clamp, as per sketch enclosed and as per IS 1239/79 (part 1) and its amendments up to date. The weight of the earth pipe with clamp per no should be 7 kg Total weight + or – 5% is allowable. The pipe shall be provided 10mm dia holes as shown in the sketch.

GI Clamp shall be as per the sketch and shall fit the circumferential surface of the GI Pipe perfectly and one of the clamps shall be welded with continuous to the pipe on all the four sides of the Clamp coming in contact with the pipe. The welded portion above must be painted with 1 coat of red oxide paint and 1 coat of aluminium paint. GI Earth Pipe with 62x12mm GI Bolt & Nut and 2mm thickness GI washer as per the sketch enclosed with ISS marked pipe.

G.I EARTH PIPE



Note :

1. ALL DIMENSIONS ARE IN MM.
2. THE EARTH PIPE IS PAINTED WITH GREEN COLOUR ON THE TOP

TANGEDCO

TITLE:
GI EARTH PIPE

SCALE

DRAWN

CHECK

APPROVED

DRG. NO.

P-EF-01

REV

1

TECHNICAL SPECIFICATION

11 KV / 22 KV Danger Notice Board

1. SCOPE

This Specification covers Danger Notice Plates to be displayed in accordance with rule No. 35 of Indian Electricity Rules, 2003.

2. APPLICABLE STANDARDS

Unless otherwise modified in this specification, the Danger Notice Plates shall comply with IS : 2551- 1982 or the latest version thereof.

3. DIMENSIONS

Two sizes of Danger Notice Plates as follows are recommended:

- a) For display at 11 KV (or higher voltages) installations - 250 x 200 mm
- b) For display at 22 KV (or higher voltages) installations - 250 x 200 mm

The corners of the plate shall be rounded off.

The location of fixing holes as shown in the drawings is provisional and can be modified to suit the requirements of the purchaser.

4. LETTERINGS

All letterings shall be centrally spaced. The dimensions of the letters, figures and their respective position shall be as shown in the drawings. The size of letters in the words in each language and spacing between them shall be so chosen that these are uniformly written in the space earmarked for them.

5. LANGUAGES

Under Rule No. 35 of Indian Electricity Rules, 2003, the owner of every medium, high and extra high voltage installation is required to affix permanently in a conspicuous position a danger notice in Hindi or English and, in addition, in the local language, with the sign of skull and bones.

The type and size of lettering to be done in English as indicated in the specimen danger notice plates shown in drawing and those in Tamil.

Adequate space has been provided in the specimen danger notice plates for having the letterings in local language for the equivalent of 'Danger','11000' and '22000' 'VOLTS'.

6. MATERIAL AND FINISH

The plate should be of Anti corrosive materials & shall be made from Hot compressed Moulded sheets made out of Sheet Moulding Compound confirming to IS 13410 with Minimum 1.6 mm thick and of printing as per the drawing, as per IS : 5 – 1978 on the front side. The front side of the Danger board shall be suitable coated with Transparent coating after printing.

7. TESTS

The following tests shall be carried out :

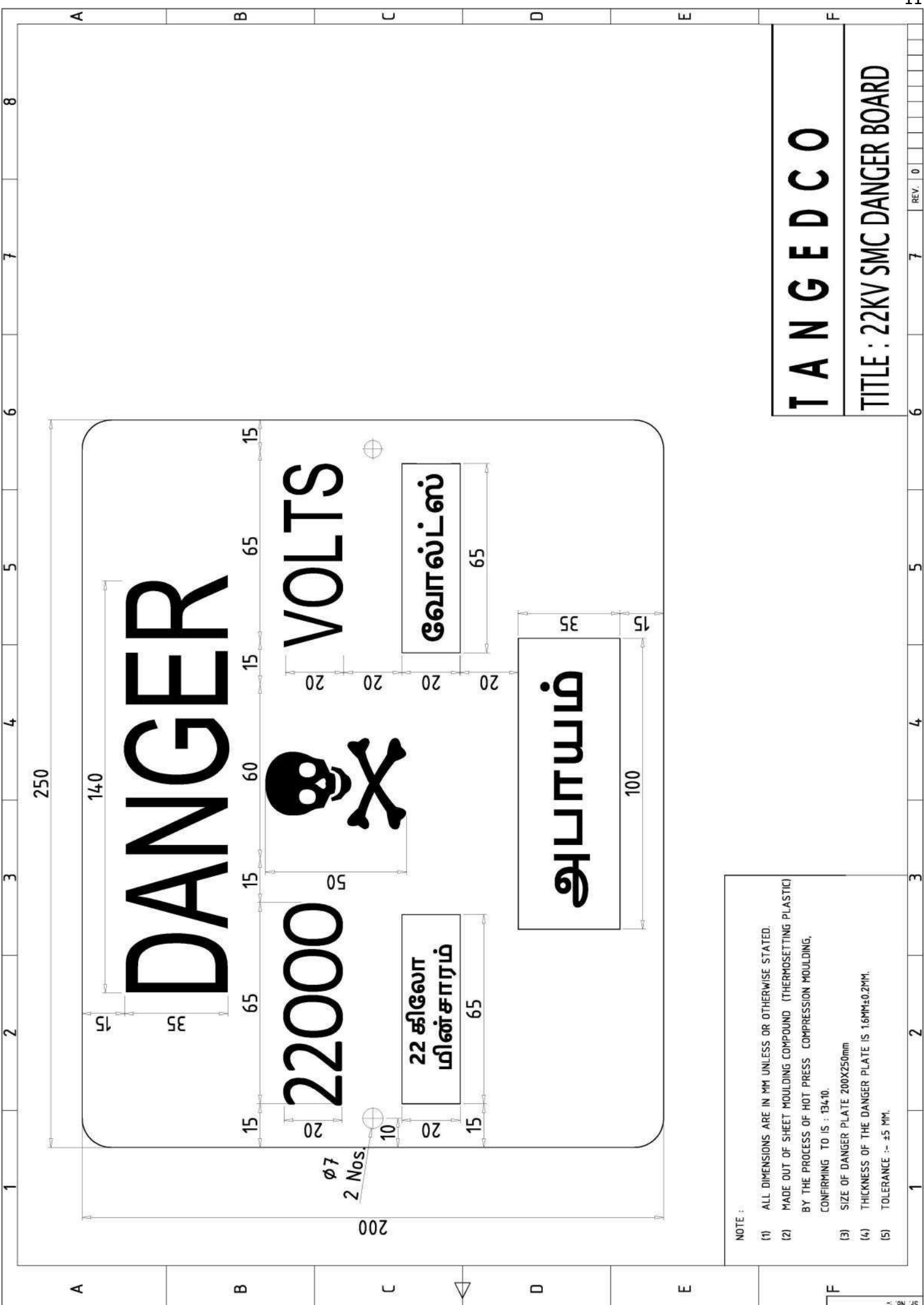
- i) Visual examination as per IS:2551-1982
- ii) Dimensional check as per IS:2551-1982
- iii) Raw materials Test certificates for SMC as per IS 13410

8. MARKING

Maker's name and trade mark and the purchaser's name shall be marked in such a manner and position on the plates that it does not interfere with the other information.

9. PACKING

The plates shall be packed in corrugated Boxes suitable for rough handling and acceptable for transit & storage.



GUARANTEED TECHNICAL PARTICULARS

11 KV/22 KV STRAIGHT TERMINAL PROTECTOR BOOT FOR TRANSFORMER

IEC60060-1-2010

1	Name of Manufacturer	
2	Address of Manufacturer	
3	Brand Name & Country of Origin	
4	Tensile Strength	3.5 N/Sqmm
5	Ultimate Elongation	300 % (min)
6	Longitudinal Change	Not Applicable
7	Hardness	50± 10 Shore A
8	Water Absorption	0.5% max
9	Low Temperature Flexibility	No Cracking
10	Dielectric Strength	12 kV/mm (min)
11	Volume Resistivity	1x10 ¹⁴ ohm cm(max)
12	Dielectric Constant	5 (max)
13	A.C Voltage Withstand	55 kv for 5 minutes with Stood No flash over and No Break down
14	Lighting Impulse Withstand ± 10	125 kv with Stood No flash over and No Break down
15	Material of the Terminal Boot	EPDM Rubber

Company Seal

:Designation :

Signature :

Date :

TERMINAL PROTECTOR BOOT KIT MATERIAL LIST

S. No.	Description	U/M	Qty.
1	Straight Terminal Protector Boot	Nos.	3
2	Cap	Nos.	3
3	Grommet	Nos.	3
4	Rain Shed	Nos.	3
5	Silicon Grease	Nos.	3
6	Mastic Tape	Nos.	3
7	Installation Manual	Nos.	1

Company Seal

:Designation :

Signature :

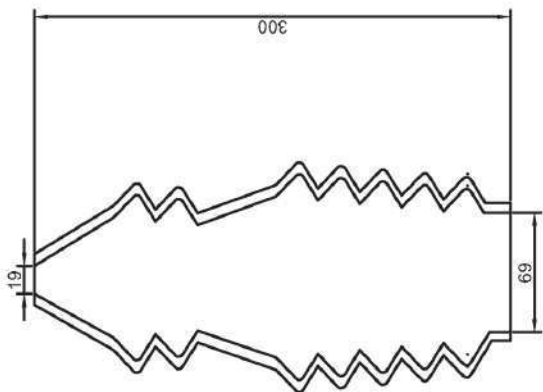
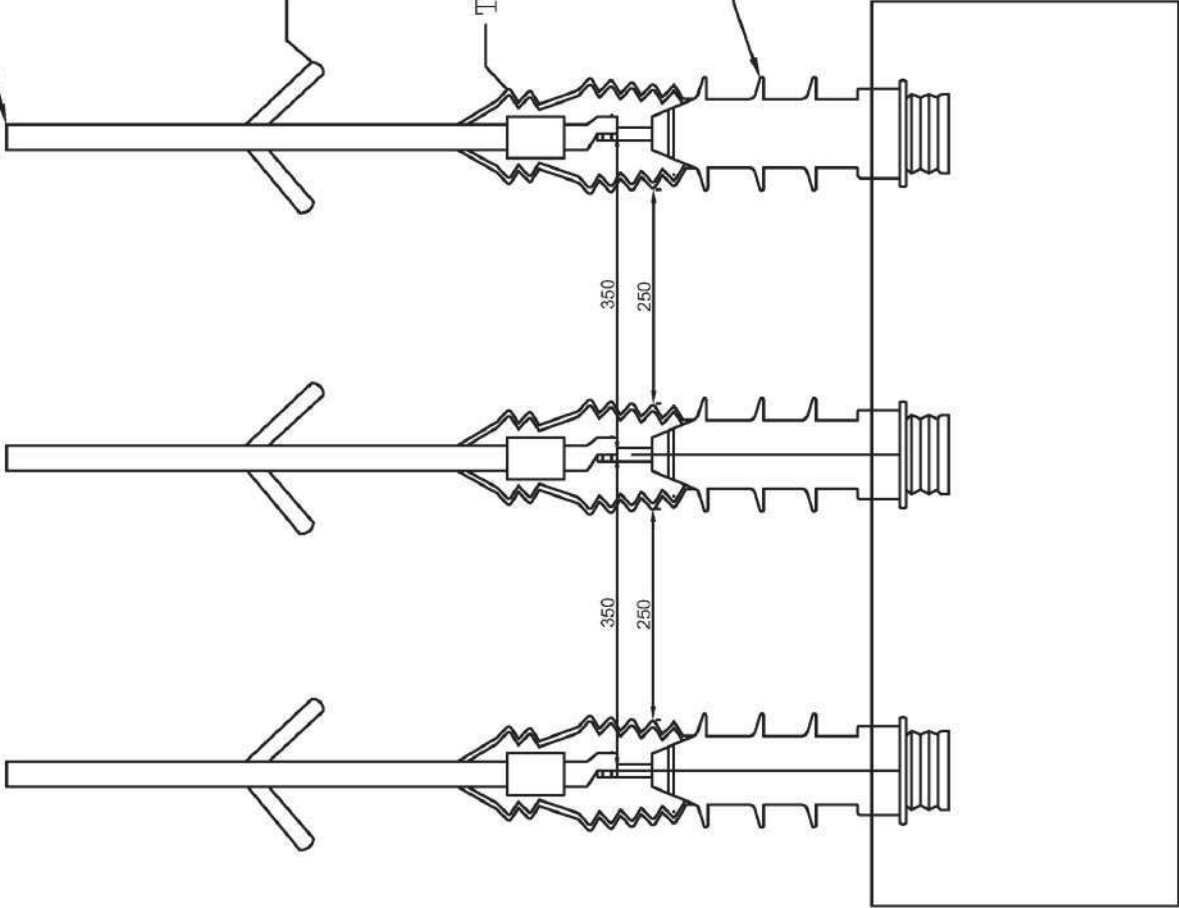
Date :

CABLE / CONDUCTOR

RAIN SHED

TERMINAL PROTECTOR BOOT

TRANSFORMER BUSHING



2	SILICONE GREASE
1	TERMINAL PROTECTOR BOOT
SR.NO.	KIT CONTENTS

TANGEDCO

TITLE:- TERMINAL PROTECTOR BOOT (STRAIGHT BOOT)
11/22KV CABLE/CONDUCTOR ONE SET.