TECHNICAL SPECIFICATION FOR 11 KV DROP OUT (D.O.) FUSE with Polymeric Insulators:

(1) SCOPE:

This specification covers outdoor, open, drop out expulsion type fuse cut outs suitable for installation in 50Hz, 11KV distribution system for protection of H.T. lines and transformer centers Tap lines. It is not the intent to specify completely herein all the details of design and construction of 11KV D.O. fuse with Polymeric Insulators. However 11KV D.O. fuses will confirm in all respects to high standards of engineering design and workmanship and shall be capable of performing in continuous commercial operation up to the supplier's guarantee in a manner acceptable to the purchases, who will interpret the meanings of drawings and specifications and shall have the power to reject any material, which in his judgment not in accordance with the specifications / drawings. The 11KV D.O. fuses offered shall be complete with all components necessary for it's effective and trouble free operation along with associated equipment such components shall be deemed to be within the scope of supplier's supply, irrespective of whether these are bought out specifically in the specification and / or in order or not. Also similar parts particularly removable shall be interchangeable.

(2) APPLICATION:

The distribution fuse cutouts are intended for use on distribution transformers and have no inherent load break capacity.

A) NORMAL SERVICE CONDITIONS : 11KV D. O. fuses to be supplied against these specifications shall be suitable for continuous satisfactory operations and all whether conditions under following tropical conditions.

a) Ambient air temperature : 40ºC
b) Maximum ambient air temperature : 50ºC
c) Maximum air temperature in shade : 45ºC
d) Minimum air temperature in shade : 0ºC
e) Relative humidity in percentage : 10 to 100%
f) Maximum annual rainfall : 1500 mm
g) Wind Pressure (Maximum) : 100Kg/m^2
h) Maximum altitude above sea level : 1000 Meter
i) Normal climate : Moderate hot and humid & Polluted by dust and smoke.

As UGVCL is having some area with chemically polluted atmosphere, the D. O. fuses if installed in such areas shall be able to function satisfactorily.

(3) APPLICABLE STANDARD:

Unless otherwise modified in this specification, the cut out shall conform to IS: 9385 (Part-I to III) as amended from time to time.

(4) RATED VOLTAGE:

The rated voltage shall be 12 KV.

(5) RATED CURRENT:

The rated current shall be 100 A.

(6) RATED LIGHTING IMPULSE WITH STAND VOLTAGE VALUES FOR THE FUSE BASE:

The rated lightning impulse withstands voltage both for positive and negative polarities shall be as given below.

a) To earth and between pole: 75KV (Peak)
b) Across the isolating distance: 85KV (Peak) of fuse base.

(7) RATED ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE (DRY AND WET) VALUES FOR THE FUSE BASE:

a) To earth and between poles: 28KV (rms)
b) Across the isolating distance: 35KV (rms)

(8) TEMPERATURE RISE LIMIT (IN AIR) :

a) Copper contacts silver faced: 65ºC
b) Terminals: 50ºC
c) Metal parts acting: The temperature shall not reach as springs such a value that elasticity of the Metal is changed.

(9) BREAKING CAPACITY:

The breaking capacity shall be 8 KA (asymmetrical).

(10) GENERAL REQUIREMENTS/CONSTRUCTIONAL DETAILS:

10.1 All ferrous parts shall be hot dip galvanized in accordance with the latest version of IS: 2633. Nuts and bolts shall conform to IS:1364. Spring washers shall be electro-galvanized.

10.2 Typical constructional details of the fuse cutout are shown in ref. drawing.

(11) FUSE BASE TOP ASSEMBLY:

11.1 The top current carrying parts shall be made of a highly conductive copper alloy and the contact portion shall be silver plated for corrosion resistance and efficient current flow. The contact shall have a socket cavity for latching and holding firmly the fuse carrier until the fault interruption is completed within the fuse.

11.2 The top contact shall be actuated by a strong steel spring which keeps it under sufficient pressure to maintain a firm contact with the fuse carrier during all operating

conditions. The spring shall also provide flexibility and absorbs most of the stresses when the fuse carrier is pushed into the closing position.

11.3 The top contact assembly shall have a robust galvanized steel hook to align and guide the fuse carrier in to the socket latch even when the fuse carrier is closed at an off centre angle.

11.4 The top assembly shall have an aluminum alloy terminal connector(refer clause 19)

11.5 The top assembly shall be robust enough to absorb bulk of the forces during the fuse carrier closing and opening operations and shall not over stress the spring contact. It shall also prohibit accidental opening of the fuse carrier due to vibrations or impact.

(12) FUSE BASE BOTTOM ASSEMBLY:

12.1 The conducting parts shall be made of high strength highly conductive copper alloy and the contact portion shall be silver plated for corrosion resistance and shall provide a low resistance current path from the bottom fuse carrier contacts to the bottom terminal connector.

12.2 The bottom assembly shall have hinge contacts made from highly conductive, anti-corrosive copper alloy and shall accommodate and make a firm contact with the fuse carrier bottom assembly. The fuse carrier shall be placed easily in or lifted from the hinges without any maneuvering. In addition, the bottom assembly shall perform the following functions.

i) When opened manually or after fault interruption the fuse carrier shall swing through 180º to the vertical and its further travel shall be prevented by the fuse base bottom assembly.

ii) The fuse carrier shall be prevented from slipping out of the self locking hinges during all operating conditions and only when the fuse carrier has reached its fully open position then only if can be removed from the hinge support.

12.3 The assembly shall have an aluminum alloy terminal connector (refer clause 19).

(13) FUSE CARRIER TOP ASSEMBLY :

13.1 The fuse carrier top contact shall have a solid replaceable cap made from highly conductive, anti-corrosive copper alloy and the contact portion shall be silver plated to provide a low resistance current path from the fuse base top contact to the fuse link. It shall make a firm contact with the button head of the fuse link and shall provide a protective enclosure to the fuse link to check spreading of arc during fault interruptions.

13.2 The fuse carrier shall be provided with a alloy opening eye (pull ring) suitable for operation with a hook stick from the ground level to pull-out or close-in the fuse carrier by manual operation.

(14) FUSE CARRIER BOTTOM ASSEMBLY:

14.1 The fuse carrier bottom assembly shall be made of bronze castings with silver plating at the contact points to efficiently transfer current to fuse base. It shall make smooth contact with the fuse base bottom assembly during closing operation.

14.2 The bottom assembly shall have a lifting eye for the hook stick for removing or replacing the fuse carrier.

14.3 The bottom assembly shall have a suitable ejector which shall perform the following functions.

i) It shall keep the fuse link in the centre of fuse tube and keep it tensioned under all operating conditions.

ii) It shall be capable of absorbing the shock when the fuse carrier is pushed into the closed position and shall not allow the fuse link to be damaged. This is specially important when the fuse link is of low ampere rating.

iii) The ejector at the instant of interruption shall retain the fuse carrier in the closed position enough to ensure that the arc is extinguished within the fuse tube thereby excluding the possibility of arcing and subsequent damage at the contact surfaces.

iv) The ejector shall help the fuse link separation after fault interruption, allowing the fuse carrier to drop out and clearing the pigtail of the blown fuse link through the bore of use tube.

(15) FUSE BASE (Polymeric):

The fuse base shall be bird-proof, single unit Polymeric Post insulator with a creep age distance (to earth) not less than 320mm. No joint in core material is allowed. The top & bottom end fitting of Post insulator shall be a one piece and made of S.G. Iron or malleable cast iron or forged steel. The top and bottom assemblies as also the middle clamping hardware shall be either embedded in the Polymeric Post insulator with sulphur cement or suitably clamped in position. For embedded components, the pull out strength shall be such as to result in breaking of the Polymeric before pull out occurs in a test. For Polymeric Post insulators, the beam strength shall not be less than 5KN. (i.e. Mechanical failing load).

For 11 KV Polymeric Post INSULATORS:

The Bidder shall submit notarized type test reports of 11 KV Polymeric Post INSULATORS as per IEC:61109 (Latest amendment if any) from Govt. approved / NABL Laboratory along with bid to prove that the Polymeric Post Insulators offered meet the requirements of the specification. These type Tests should have been carried out within Seven years prior to the date of opening of this tender

(16) FUSE TUBE:

The fuse tube shall be made of fiber glass coated with ultraviolet inhibitor on the outer surface and having arc quenching bone fiber liner inside. The tube shall have high bursting strength to sustain high pressure of the gases during fault interruption. **The inside diameter of the fuse tube shall be 17.5mm and outer diameter shall be 22mm.** The solid cap of the fuse carrier shall clamp the button head of the fuse link, closing the top end of the fuse tube and allowing only the downward venting during fault interruption.

(17) <u>TYPE TESTS</u> :

A. The 11 KV D.O. Fuse shall be subjected to the following type tests in accordance with relevant IS with latest amendment

i) Dielectric tests (rated impulse withstand and rated one minute power frequency withstand test voltages). Clause No. 6 and 7 of this specification

ii) Temperature rise test. Clause No. 8 of this specification.

The above tests shall be carried out in accordance with IS: 9385 Parts I and II.

FOR Polymeric FUSE BASE ONLY:

iii) Pull out test for embedded components of the fuse base.

iv) Test on fiber glass tube.

One sample of fiber glass tube will be selected from the lot under inspection and also for the type test and tested for the following tests as per BS-3953/105. Grade MF4 with latest amendment if any.

a) Electric strength of 25KV when tested edgewise in oil at 90ºC.

b) Insulation resistance of 10meg. Ohm (minimum) after emersion in water at 500V DC.

v) Galvanize test as per IS: 2633/72 with test amendment of any All the M. S. and C. I. galvanized parts shall be tested for the galvanizing test as per IS-2633/72 with latest amendment if any after emerging the test pieces into copper sulphate solution having specific gravity of 1.180 and temperature 18º ± 2ºC dips each of one minute will be carried out. The M. S. C. I. parts will not show any permanent copper deposition.

vi) Physical operation test i.e. ON-OFF observations.

The D. O. fuses shall be fixed as on pole at a height of at least 4 meters as in actual use. 100 nos. of ON-OFF operations shall be carried out with the help of operating rod. After the operations are over, the fuse shall be brought down and examined visually as regards assembly, fittings etc.

B. <u>The type tests are intended to verify the main characteristics of a composite insulator. The type tests shall be applied to composite insulators, the class of which has passed the design tests.</u>

<u>Following type test shall be conducted on a suitable number of individual insulator units, components, materials or complete strings.</u>

1) Dry lightning impulse withstand voltage test : As per IEC 61109 : 2008 (clause 11.1)
2) Wet power frequency test : As per IEC 61109 : 2008 (clause 11.1)
3) Bend test : As per IS:731 (Clause- 10.8.2)
4) Radio interference test : As per IS:8263/ IEC:437/CISPR 18-2.
5) Recovery of Hydrophobicity test : Annexure-B (As per STRI guide) This test may be repealed every 3 yrs by the manufacturer
6) Chemical composition test for silicon content : Annexure-B (As per EDX/ thermo-gravimetric Method)
7) Water Diffusion test on FRP rod : As per IEC 1109 C.lno.5.4.2
8) Brittle fracture resistance test : Annexure – B
9) Dry power frequency test : As per IEC 61109 : 2008 (clause 11.1)
10) UV test: Clause 7.2 of ANSI C29.13.

The bidder shall submit type test reports as per IEC 61109 (with latest amendments, if any) from NABL approved laboratory along with the bid. Additional type tests required if any shall be carried out by the manufacturer, after award of contract for which no additional charges shall be payable. In case, the tests have already been carried out, the manufacturer shall submit reports for the same.

(18) MOUNTING ARRANGEMENT :

18.1 The cutouts shall be provided with a suitable arrangement for mounting these on 75X40mm channel cross arm as shown in ref. drawing and shall provide the necessary clearances from the support. Mounting arrangement shall be made of high strength galvanized steel flat and shall be robust enough to sustain the various stresses encountered during all operating conditions of the cutout. **The "C" Channel should be fabricated from M.S Sheet having thickness of 3.0 mm Minimum**.

18.2 The strength of the M-14 bolt shall in no case be less than 1900 Kg. and the strength of M-10 bolts shall be in no case less than 3500 Kg.

(19) TERMINAL CONNECTIONS:

The cutout shall be provided with two aluminum alloy (alloy designation 2280 (A-11) as per IS: 617-1975) terminal connectors at top and bottom of fuse base assemblies to receive aluminum conductors of diameters between 6.3mm to 10.05mm. These terminals shall be easily accessible irrespective of the cutout location with respect of the pole. The terminals shall meet the test requirements of REC construction standard E-30.

(20) NAME PLATE :

Aluminum anodized name plate shall be fixed at base of D.O. fuse. The following information shall be duly punched or engraved on it.

1) Manufacturer's name
2) A/T No. and date

3) Rated voltage
4) Rated normal current
5) Frequency
6) Sr. No. of D. O. fuse
7) Property of UGVCL etc.

(21) INSPECTION :

All tests and inspection shall be made at the place of manufacture unless otherwise especially agreed upon by the manufacturer and the purchaser at the time of purchase. The manufacturer shall afford the inspector representing the purchaser all reasonable facilities without charge, to satisfy him that the material is being furnished in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is dispute regarding the quality of supply.

(22) ROUTINE TESTS :

The following routine tests shall be carried out by the manufacturer on each unit to check the essential requirements.

a) Visual inspection.
b) Verification of all dimensions.
c) Power frequency voltage dry test.

Supplier is required to maintain the register for routine tests and will show to the inspector, who comes for inspection for verification / confirmation purpose.

(23) ACCEPTANCE TESTS:

The following tests shall be carried out at supplier's works on the samples selected from the offered lot as per the sample procedure given at clause No. 24 of this specification.

i) Visual inspection.
ii) Verification of dimensions of all parts as per approved drawings of UGVCL for 11KV DO fuse
iii) Power frequency voltage dry test as per IS: 9385 (Part-II) with latest amendment if any.
iv) Physical operation test ON-OFF operation (100 Nos. ON-OFF operation) procedure as per Clause No. 17 (vi).
v) Temperature-rise test.
Only on one (1) sample for each lot as per the procedure given at Clause No. 17.ii and Clause No. 8 of this specification.
vi) Galvanizing test.
As per procedure given at Clause No. 17 (v).
vii) Test on F. R. B. P. Tube.
As per procedure given as Clause No. 17 (iv).

(24) SAMPLE PROCEDURE FOR ACCEPTANCE TESTS :

One sample from each 100 Nos. or part of it to be selected at Random from offered lot for carrying out all acceptance tests mentioned above at Clause No. 23 except for temperature rise test, which shall be carried out on only one (1) sample from offered lot.

On passing of all samples in all above tests then only lot shall be accepted. In the event of failure of any one sample in any one or more tests, the lot under inspection shall be rejected.

(25) TEST CERTIFICATE FOR POLYMERIC INSULATOR :

For the offered lot supplier shall have to submit acceptance and routine test certificate received from the original manufacturer for 11KV polymeric insulator and FRBP tube used in the manufacturing of D.O. fuse. It is preferred that insulators of same make are used in one lot. However, if insulators of different make are used in one lot of D. O. fuse then supplier will have to submit acceptance / routine test certificates received from the respective original manufacturer for the insulators used in D. O. fuse.

(26) Although the samples selected at random by the UGVCL's Engineer from supplier's works have passed the specified tests and then accepted, the UGVCL reserves the right to test the materials received at destination in any of the Government Approved/NABL laboratory. However in the event of the samples failing in one or any of the tests prescribed or materials found defective the supplier shall replace such materials at the destination concerned and complete lot in case it fails in one or more tests on receipt of information from the Company.

(27) APPROVAL OF PROTOTYPE SAMPLE :

On receipt of firm order the supplier has to prepare and offer the prototype sample within thirty days for carrying out all acceptance tests mentioned at Clause No. 23 at the supplier's works in presence of UGVCL's Engineer. The cost of inspection / testing to be borne by the supplier only after approval of prototype in writing by UGVCL the supplier can start and make further arrangement to offer the materials in bulk.

NOTE :

1) Tenderer has to submit Three (3) Nos. of samples for the item offered along with the offer.
2) Offer without sample will be out rightly rejected.
3) UGVCL will not accept any deviation in the technical specification from what is specified in this specification and drawings attached herewith. In case any deviation is found in the offer from UGVCL's Technical specification and drawing offer will be rejected without making any further reference. The UGVCL will not accept any subsequent clarification or modification in the technical specification after tender is opened i.e. after due date of opening of tender. It is therefore required for each tenderer to quote strictly as per attached specification and drawing.
4) Tenderer shall attach required type test certificate along with attested drawings from Govt. Approved/NABL laboratory as per Clause No. 17 of technical specification with offer.

Provisional / in complete type test certificate will not be considered for technical evaluation purpose.

5) Tenderer shall also submit his own approved drawing in line with UGVCL specification for each rating with mentioning details of each part with dimensions and other technical details along with the offer duly signed and with company's seal and full address.
6) Tenderer shall furnish details of list or orders executed / pending with UGVCL and other Electricity Boards along with the offer.
7) Tenderer shall submit list of plant / machinery / testing facility details etc. along with the offer.
8) Tenderer is required to fill up the technical details in UGVCL's format only for " Guaranteed Technical Particulars" duly signed sealed with company's name.Offer not filled in UGVCL's Guaranteed Technical Particulars format will not be considered.

28. PACKING:

The ordered quantity of material shall be packed in strong corrugated box of mini. 7 ply with max. 6 Nos. of D.O.Fuse in one box.

Annexure-A

GUARANTEED TECHNICAL PARTICULARS

GUARANTEED TECHNICAL PARTICULARS FOR SUPPLY OF 11KV – 100 AMPS. RATING D. O. FUSES WITH POLYMERIC SUITABLE FOR OUTDOOR VERTICAL INSTALLATION.

PART – A:

Sr. No.	Particulars	Confirmation
1.	D. O. Fuses shall confirm high standard engineering, capable for continuous commercial operation and suitable for outdoor vertical mounting.	Yes
2.	Normal system voltage 11KV	Yes
3.	Rated Voltage – 12KV	Yes
4.	Rated frequency – 50 Hz.	Yes
5.	Rated normal current 100 Amps.	Yes
6.	Rated – 1 (one) minute power frequency withstand voltage.	
	a) To earth and between poles: 28KV (rms)	Yes
	b) Across the isolating distance: 35KV (rms)	Yes
7.	Lightening Impulse Voltage With stand	
	a) Earth & between poles - 75 KV (Peak)	Yes
	b) Across the isolating distance: 85KV (Peak) of fuse base.	Yes
8.	Breaking Capacity – 8KA	Yes
9.	Contact shall be made from phosphorus bronze (Copper Alloy)	Yes
10.	The fuse band shall be made from fiber glass tube (FRBP Tube) made from synthetic resin bounded woven glass fabric grade MF-4 laminated sheet as per BS-3953/1976	Yes
11.	11KV Polymeric Insulators having 320mm minimum creep age distance and 5 KN (minimum) mechanical failing load shall be provided or any other UGVCL /Other Discom of GUVNL approved.	Yes
12.	All M. S. Bolts, Nuts, Washer above 10mm, ferrous shall be hot dip Galvanized.	Yes
13.	Temperature rise limits as per specification clause No. 8.	Yes
	a) Copper contacts silver faced: 65ºC	
	b) Terminals: 50ºC	
	c) Metal parts acting: The temperature shall not reach as springs such a value that elasticity of the Metal is changed.	
14.	Aluminum anodized name plate with necessary information as per clause 20 of technical specification be fixed on base suitably.	Yes
15.	D.O. Fuse shall be manufactured in line with our specification &	Yes

Signature of Tenderer:		
Date:	Place:	Company's Round Seal:

Relevant I.S. as per latest amendment up to date of Tender

PART – B:

BIDDER HAS TO ENCLOSED FOLLOWING DOCUMENTS AND HAS TO CONFIRM THE REQUIREMENT

Sr. No.	Particulars	Confirmation
1.	Type test certificate as per tender specification Clause No. 17 from Govt. approved /NABL laboratory	Yes
2.	Name of Laboratory: Test report number and Date:	Yes
3.	List of Plant and Machinery	Yes
4.	Three (3) Nos. of samples to be sent with tender	Yes

PART – C:

BIDDER HAS TO MENTION BELOW DEVIATION IF ANY, QUOTING RELEVANT CLAUSE OF SPECIFICATION.

SIGNATURE AND SEAL OF TENDERERS

Annexure-B

Signature of Tenderer:		
Date:	Place:	Company's Round Seal:

Test on 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 voltage of 10 kV & 30 kV for 11 kV & 33 kV class insulators respectively under dry condition. The test procedure shall be in accordance with IS : 8263/IEC:437/CISPR 18-2.

2. Brittle Fracture Resistance Test

Brittle fracture test shall be carried out on naked rod along with end fittings by applying "1n HNO3 acid" (63 g conc.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 4 mm thick samples of 5 cm x 7 cm.

(i) The surface of selected samples shall be cleaned with isopropyl alchohol. Allow the surface to dry and spray with water. Record the Hydrophobicity classification in line with STRI guide for Hydrophobicity classification (Extract enclosed at Annexure-D) Dry the sample surface.

(ii) The sample shall 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 1 mm above the sample surface. Tentative arrangement shall be as shown in Annexure-E. 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-2 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.

Signature of Tenderer:		
Date:	Place:	Company's Round Seal: