

**Schedule "A"**

**1. SCOPE :**

This specification covers design, manufacturing, testing at manufacturer's works, inspection, packing & delivery of 11 KV Air Break Switch with accessories for out-door installation for use on transformer centers and tap line in Gujarat State.

- 1.1 It is not the intent to specify completely herein all the details of design and construction of Air Break Switches. However, AB Switches will conform 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 purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any material, which in his judgment i.e. not in accordance with the specifications/drawings.

The A. B. Switches offered shall be complete with all components necessary for its effective and trouble-free operation along with associated equipment etc. such components shall be deemed to be within the scope of supplier's supply, irrespective of whether those are specifically brought out in the specification and/or in order or not. Also similar parts particularly removable ones shall be inter-changeable.

**2. SCHEDULE OF REQUIREMENT :**

The detail requirement of 11 KV A. B. Switches to be supplied against the specification are given in Schedule "A".

**3. APPLICABLE STANDARDS:-**

1. IS/IEC 62271-103:2011 with latest Amendment if any.
2. IS/IEC 62271-1:2007 with latest Amendment if any.
3. IS: 2633/1986 with latest amendment if any and other relevant IS number Mentioned in the specification.
4. IS: 1897/2008 with latest amendment if any (Copper strip for electric purpose).
5. IEC 62231-ED 1-0-2006 with latest amendment if any.
6. IS:10742/1983 with latest amendment if any (chemical composition for gun metal)
7. IS 1161:1998 with latest amendment if any (Steel Tubes for Structure Purpose)

**4. NORMAL SERVICE CONDITIONS :**

A. B. Switches to be supplied against this specification shall be suitable for satisfactory continuous operations under following tropical conditions.

- |                                     |  |
|-------------------------------------|--|
| 1. Ambient Air Temperature          | : 40° C  |
| 2. Maximum ambient air temperature  | : 50° C  |
| 3. Maximum air temp. in shade       | : 45° C  |
| 4. Minimum air temp. in shade       | : 0° C   |
| 5. Relative humidity in percentage  | : 10 to 100  |
| 6. Maximum annual rainfall          | : 1500 mm  |
| 7. Wind Pressure (Max.)             | : <u>100 Kg/m<sup>2</sup></u>                          |
| 8. Maximum altitude above sea level | : 1000 Meters  |
| 9. Normal climate                   | : Moderate hot and humid and Polluted by dust & smoke. |

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4.1 As Gujarat state is having large area with seashore having saline atmosphere, the A.B. Switches if installed in such area shall be able to function satisfactorily.

**5. GUARANTEED TECHNICAL PARTICULARS (G.T.P):**

The 11 KV A. B. Switches covered in this specification shall meet the guaranteed technical particulars mentioned in Schedule-B.

**6. CURRENT DENSITY:**

Current density to be adopted for all parts of A.B. Switches and terminal connectors shall not exceed the following limits.

Copper	:	2.00 Amp. / sq.mm.
Aluminum Alloy	:	1.25 Amp. / sq.mm.
Gun Metal Base	:	1.63 Amp/mm <sup>2</sup>

**7. CONSTRUCTIONAL FEATURES:**

The A.B. Switches shall have triple pole construction and shall be suitable for vertical mounting. For 11 KV A.B. Switch, there shall be two 11 KV Polymeric Insulator having 320 CD mounted on 75 X 40 mm M.S. Channels per phase.

The channel support shall be mounted on a steel frame made of two channel supports. The switch shall be manually operated with a locking type arrangement through a 25 mm Hollow Square coupling rod of 2 mtr length and G.I. Pipe of 30 mm dia meter and 6 meter length with operating handle.

7.1 11 KV Polymeric Insulators to be used in manufacturing of A.B. Switches should be confirm to IEC 62231-ED-1-0 2006- and mentioned therein with latest amendment.

**For 11 KV Polymeric Post INSULATORS:** The Bidder shall submit notarized type test and Design test (as per IEC 62231-ED-1-0 2006-) reports of 11KV Polymeric Post Insulators as per IEC: 62231-ED-1-0 2006 & latest amendment if any, from Govt. approved/NABL laboratory along with bid

The supplier will have to offer inspection of Polymeric insulators at works of manufacturer, before offering prototype and lot of A.B. Switches at their own cost.

7.2 Male and female contacts shall be prepared from hard drawn copper strip as per 1897/1983 (with latest amendment if any). The chemical composition of copper shall be as under:

<b><u>Element</u></b>	<b><u>Percent</u></b>
1. Copper (Min.) including silver & oxygen	: 99.90
2. Bismuth (Max.)	: 00.001
3. Lead Max.	: 00.005
4. Total of all impurities excluding silver and Oxygen (Max.)	: 00.003

Further the contact should be silver plated with thickness of coating not less than 2.5 Micron. The speed of breaking of load current shall be independent of the speed of operation. The male and female contacts from electrolytic copper will have to be

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mounted on the Gunmetal base. The arcing horn should be provided on the G.M. base and they should be made in such a way that they make contact before the male-female contact make the contact and should part only after the male and female contact have completely separated while switching off operation.

Gun Metal chemical composition should be as per IS-10742/1983, Grade-II of Table-I and current density of Gun Metal Base should be 1.63 Amp/mm<sup>2</sup>.

- 7.3 The spacing between the phases shall be adjustable between 600mm to 700mm for 11 KV switch. Total length of square coupling rod shall be 2000 mm for 11 KV class minimum. The Hollow square rod for coupling the three phases should be made from square G.I. Pipe having outside dimensions 25 mm x 25 mm and 3 mm thick duly hot dip galvanized as per IS : 2633/1986.
  - 7.4 Vertical operating pipes shall be GI Pipe of medium class with Nominal Bore: 25 mm as per IS 1161/1979 with latest amendment. Length of the operating pipe shall be of 6000 mm. Weight: 2.41 Kg/mtr. Weight of pipe should be 14.46 kg of 6 mtr. Length as per IS 1161/1979 with latest amendment.
  - 7.5 The A.B. Switch shall be mounted with an aluminum anodized nameplate to be fixed on base channels with rivet on all poles. It shall carry the following information duly punched or engraved on it manufacturer's name, A/T No. and date, Rated voltage, Rated normal current, rated frequency Sr. No. of A.B. Switch, Property of PGCVCL etc.
  - 7.6 Suitable arrangement should be provided to lock the operating handle in 'ON' and 'OFF' position.
  - 7.7
    - a) Bolts, Nuts, Washers etc. below 5/8" (15.875 mm) shall be of electro galvanized or nickel plated and for sizes 5/8" (15.875 mm) and above shall be of hot dip galvanized in accordance with IS: 2633 with latest amendment, if any.
    - b) The Hollow square rod and GI Pipe shall also be hot dip galvanized in accordance with the IS: 2633 with latest amendment, if any.
  - 7.8 The Switch shall be provided with aluminum lug type terminal connector made of Aluminum material, with the long barrel, long palm with hole suitable for 12 mm bolt and bimetallic Plate, suitable as per the requirement of DOG conductor size.
  - 7.9 The Polymeric insulators shall be mounted on a tilting base, which shall be made of cast metal with smooth surface. The supplier has to make suitable arrangement for fixing the hollow square rod and connector of vertical rod for smooth and trouble-free operation.
- Bearing plate with 2 Nos. brass ring (Bearing Bush) **minimum 10mm thickness (Rib Height) and thickness of bearing bush should be minimum 2 mm as shown in tender drawing & other dimension as per tender drawing** for phase i.e. total 6 Nos. bearing for 1 set
- 7.10 The female contact spring shall be made of **SS, Grade 304 & 12 mm ID, 1.5 mm thickness** for assisted operation.

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**8. QUALITY CONTROL :**

The manufacturers shall assure proper quality control for the manufacture of A.B. Switches, tolerance of +5% in dimensions where tolerance not specified is allowed.

Note:-No negative tolerance is allowed for current carrying parts.

**9. TESTING & INSPECTION:-**

**9.1 (A) TYPE TEST:-**

The A.B. switches shall be subjected to the following type tests in accordance with IS/IEC 62271-103:2011 with latest Amendment if any. 2. IS/IEC 62271-1:2007 with latest Amendment if any.

- i) Dielectric tests including lightning impulse withstand test, power frequency voltage withstand test
- ii) Short time withstand current and peak withstand current test.
- iii) Temperature rise tests.
- iv) Tests to prove satisfactory operation and Mechanical endurance.(M1 class)
- v) Measurement of the resistance of main circuit.

**(B) TYPE TEST:- (For Poly. Post Insulator )**

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

- 1) Dry lightning impulse withstand voltage test : As per IEC 62231-ED-1-0 2006
- 2) Wet power frequency test : As per IEC 62231-ED-1-0 2006
- 3) Bend test/Cantilever failing Load Test : As per IS/IEC: 62231-ED-1-0 2006-
- 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 yrsby 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 IS/IEC: 62231-ED-1-0 2006-
- 8) Brittle fracture resistance test : Annexure – B
- 9) Dry power frequency test : As per IEC 62231-ED-1-0 2006
- 10) UV test : Clause 7.2 of ANSI C29.13.

The bidder shall submit type test reports as per 62231 clause No.9.2.1,9.2.2,9.3.1 (with latest amendments, if any) from Govt. approved/NABL approved laboratory along with the bid.

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Date:	Place:	

**9.2 ROUTINE TEST:**

The following routine test as per IS/IEC, 62271-103:2011 & IS/IEC 62271-1:2007 with latest Amendment if any shall be carried out by the manufacturer on each unit to check certain essential requirements.

- i) Dielectric test as per above standard.
- ii) Measurement of the resistance of the main circuit.
- iii) Mechanical operating tests.
- iv) Tightness Test
- v) Design and Visual Check Test

**9.3 ACCEPTANCE TESTS :**

The following acceptance test should be carried out as per IS/IEC, 62271-103:2011 & IS/IEC 62271-1:2007 with latest Amendment if any on number of samples selected from the offered lot.

- i) Visual Inspection.
- ii) Checking of Dimensions (of all parts as per the approved drawing).
- iii) Dielectric test including power frequency voltage withstand Test in accordance as per IS/IEC, 62271-103:2011 & IS/IEC 62271-1:2007 with latest Amendment if any.
- iv) Measurement of the resistance of the main circuit in accordance as per IS/IEC, 62271-103:2011 & IS/IEC 62271-1:2007 with latest Amendment if any
- v) Test to prove satisfactory operation in accordance as per IS/IEC, 62271-103:2011 & IS/IEC 62271-1:2007 with latest Amendment if any The A.B. Switch shall be fixed as on pole at a height of at least 4 meter as in actually use.
- vi) Galvanizing test as per IS: 2633.
- vii) Temperature rise test in accordance as per IS/IEC, 62271-103:2011 & IS/IEC 62271-1:2007 with latest Amendment if any. (only on one set of sample for each lot).

The temperature rise shall not exceed the maximum limit specified. The Switch shall be mounted approximately under the usual service conditions and shall be protected against undue heating or cooling. The test shall be made with the rated normal current of 400 Amps for the switch and the rated frequency of 50 cycles. The test shall be made for a period of time sufficient for temperature rise to reach a constant value (variation not to exceed 1(C per hour).

The temperature shall be measured by means of thermocouples only.

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

The temperature rise measured with the above test shall not exceed, maximum, limits specified under :-

Sr. No.	Name of part	Temperature rise limit at an ambient temperature Not exceeding in C
1.	Silver faced copper contacts	65 <sup>0</sup> C
2.	Terminals of switches intended to be connected by external Conductors by screw or bolt.	65 <sup>0</sup> C

**9.4 SAMPLE PROCEDURE FOR ACCEPTANCE TESTS:**

One sample (i.e. one set) from each 50 sets or part of it to be selected at random from offered lot for carrying out all acceptance tests mentioned above, except for temperature rise test, which is to be carried out only on 1 sample (i.e. on one set) from the offered lot.

9.5 For the offered lot, the supplier will have to submit acceptance & routine test certificate received from the original manufacturers for the Polymeric insulators used in the manufacture of A.B. Switches. It is preferred that insulators of same make are used in lot, However, if insulators of different makes other than offered in GTP are used in any lot of A.B. Switch, then the supplier will have submit type test & routine test certificates received from the respective original manufacturers (registered vendor of DISCOM only) for the insulators used in A.B. Switches with prior approval of PGVCL.

The supplier will have to submit chemical composition certificate from the original manufacturer for the contacts used in A.B. Switches for every lot.

**10.** All test and inspection shall be made at the place and cost of manufacturer in presence of Company's Engineer.

**11.** Although the samples selected at random by the Company from the supplier's work have passed the specified tests and then accepted. The Company reserves the right to test, the materials after receipt at the destination by arranging the testing in any of the Govt. approved/NABL laboratory. However, in the event of the samples failing in the test or the materials otherwise found defective, the supplier shall replace such materials at the destination concerned on receipt of intimation from the Company.

**12. APPROVAL OF PROTOTYPE SAMPLE:**

On receipt of Order, the supplier has to prepare and offer a prototype sample within thirty days for carrying out all acceptance tests mentioned in clause No. 9.3 at the supplier's works at the cost of supplier in the presence of inspectors of PGVCL. Only after specific written approval of the prototype sample from PGVCL, the supplier shall make further arrangement to manufacture and offer the first lot. If, the offered design is type tests, the supplier shall be exempted to carry out them again.

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

**13. DETAILED DRAWINGS :**

The dimensions, clearance and general arrangement of 11 KV A.B. Switches is required to be maintained as per attached **Tender** drawing. The supplier has to prepare prototype sample as per Tender drawing. The bidder shall have to submit **notarized** type test certificate showing all the laid type tests mentioned in clause No.9.3 from Govt. approved/**NABL** laboratory along with attested drawings by testing authority along with the offer. The original type test certificate will be verified at the time of prototype sample inspection.

**Manufacturer's Name:  
And Address:**

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

**Schedule "B"**

**G.T.P. Guaranteed Technical Particular for supply of 11 KV Air Break Switch suitable for outdoor vertical installation.**

**PART-A.**

Bidder has to confirm following important requirement.

<b>Sr. No.</b>	<b>Particulars</b>	<b>Confirmation</b>
1	11 KV Outdoor type Air Break switch shall confirming IS/IEC, 62271-103:2011 & IS/IEC 62271-1:2007 with latest Amendment if any, IS: 2633 IEC 62231-ED-1-0 2006 & IS 10742/1983 with latest amendment if any and as per drawing.	Yes
2	Rated system voltage – 11 KV	Yes
3	Rated frequency - 50 Hz	Yes
4	Rated Normal current - 400 Amp.	Yes
5	No. of Poles - 3	Yes
6	Rated lightning impulse withstand voltage KV (Peak):	
	i) To switch connector and earth - 75 KV switch being in closed position. ii) Across the terminals of open switch – 85 KV disconnecter.	Yes Yes
7	Rated one minute power frequency withstand voltage:	
	i) To switch connector and earth ii) Across the terminals of open Switch disconnecter.	28 KV 32 KV Yes Yes
8	Rated short time withstand current one second 16 KA	Yes
9	Rated peak withstand - 40 KA current	Yes
10	Resistance of switch at 20 degree C as per cl.6.4 of IS/IEC, 62271-103:2011 & IS/IEC 62271-1:2007 with latest Amendment if any.	Yes
11	Type of mounting vertical	Yes
12	Fixed and moving main contacts:	
	a) Female type of contacts with spring actions on either side and male type moving contacts.	Yes
	b) Material of contacts shall be of copper hard drawn grade and chemical composition of copper shall be as mentioned in cl.no.7.2 of specification.	Yes
	c) Contact shall be silver plated	Yes
	d) Thickness of silver coating (min.) on contacts - 2.5 micron.	Yes
	e) Current density of contact - 2 Amp. sq. mm	Yes
f) Current carrying capacity - 400 Amps	Yes	
13	Terminal connection of :	
	a) Type - fixed	Yes
	b) Material - Allu. Alloy	Yes
	c) Current density - 1.25 Amp./sq.mm	Yes
d) Current carrying capacity - 400 Amps.	Yes	

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Date:	Place:	



14	Arcing contacts of: a) Type – make before & break after b) Material - MS Galv. of 10 mm dia. c) Current carrying capacity - 10 Amp.	Yes Yes Yes
15	Bus Polymeric insulator: a) No. of Bus Polymeric insulators per phase – 2 Nos. each of 12 KV with creepage distance of each insulator - 320 mm. b) Name of material to be used for manufacturing of insulator with class/grade-silicon <b>30% min.</b>	Yes Yes
16	Method of galvanizing for bolts, Nuts, washers etc. i) size below 5/8" – Electro galvanized or nickel plated ii) Size 5/8" and above hot dip galvanized as per IS: 2633. iii) hollow square rod having outside dimensions - 25 mm x 25 mm x 3 mm thick and 2000mm long duly hot dip galvanized as per IS:2633.	Yes Yes Yes
17	Diameter of FRP Rod used in 11 KV Post polymeric insulator should min. 24 mm as per tender Drawing.	

**PART-B**

Bidder has to enclose following documents.

Sr. No.	Particulars	Confirmation
1	List of Plant and machinery	Yes
2	list of testing facilities	Yes
3	List of orders executed/pending at least for past two years for the items offered a) With GEB/GUVNL/DISCOMS b) With purchaser other than GEB/GUVNL/DISCOMS	Yes Yes
4	Drawing No.	Yes
5	Type test details as per cl.9.1 of tender specifications	Yes
6	Chemical composition as per cl.7.2 of tender specification for copper	Yes
7	One (1) set of sample is to be submitted with tender.	Yes
8	Mention make of Polymeric Post Insulator (registered vendor of DISCOM) offered in tender sample.	_____

**PART-C:**

Bidder has to mention below deviation if any, quoting relevant clause of specifications.

**Signature and Seal of Tenderer.**

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