Gujarat Power Research & Development Cell
(A Govt. of Gujarat Initiative)
Gujarat Urja Vikas Nigam Ltd
CIN: U40109GJ2004SGC045195,
IIT Gandhinagar Research Park, IIT Gandhinagar,
Palaj-382355, Gandhinagar, Gujarat, India
www.guvnl.com; www.gprd.in; guvnlrnd@gprd.in

TECHNICAL SPECIFICATION

FOR

11 KV, 400 Amps AIR BREAK SWITCH WITH EARTH BLADE with FRP base Channel (11KV ABEB Switch-400Amp)

TECHNICAL SPECIFICATION NO:

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1. SCOPE :

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

This specification covers design, manufacturing, testing at manufacturer's works, inspection, packing & delivery of single/double pole mounted 11 KV Air Break Switch with the Earth Blade; with accessories mounted on FRP base Channel for out-door installation for use on, various 11 KV feeders 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 with the Earth Blade. However, ABEB Switches will confirm in all respects to high standards of engineering design and workmanship and shall be capable of performing in continuous Commercial operation. 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, is not in accordance with the specifications/drawings.

The ABEB Switches offered shall be complete with all components necessary for its effective and trouble-free operation during its service period, along with associated equipment etc. Such components shall be deemed to be within the supplier's scope, 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 detailed requirement of 11 KV ABEB Switches to be supplied against the specification are given in Schedule 'A'.

3. APPLICABLE STANDARDS:-

1. IS 62271-102:2011 with if any latest amendment
2. IEC 62271 -103, 2003 with if any latest amendment
3. IS 2633/1986 with latest amendment if any and other relevant IS number mentioned in the specification. .
4. IS 2544/1973 with latest amendment, if any.
5. IEC: 61109 with latest amendment if any.
6. IEC: 62231 with latest amendment if any.
7. IEC60129/IEC62271-103/IS 9921 - Alternating current disconnector (Load break isolators) and earthing switch
8. IEC 60265-1/IS 9920:1988- High voltage switches.
9. IS 6746 – Unsaturated polyester Resin System

10. ASTM D792. "Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement."
11. ASTM D4475. "Standard Test Method for Apparent Horizontal Shear Strength of Pultruded Reinforced Plastic Rods by the Short Beam Method."
12. ASTM D5028. "Standard Test Methods for Curing Properties of Pultrusion Resin by Thermal Analysis."
13. ASTM D4476. "Standard Test Method for Flexural Properties of Fiber Reinforced Pultruded Plastic Rods."
14. ASTM D570. "Water Absorption of Plastics."
15. ASTM D3171. "Standard Test Methods for Constituent Content of Composite Materials."
16. ASTM D7205. "Standard Test Methods for Tensile Properties of Fiber-Reinforced Polymer Matrix Composite Bars."
17. ASTM D7617. "Standard Test Method for Transverse Shear Strength of Fiber-Reinforced Polymer Matrix Composite Bars."
18. ASTM E831. "Standard Test Methods for Linear Thermal Expansion of Solids Materials by Thermo-Mechanical Analysis."
19. ASTM D3418. "Standard Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry."
20. ASTM D7705. "Standard Test Method for Alkali Resistance of Fiber Reinforced Polymer (FRP) Matrix Composite Bars used in Concrete Construction."
21. ASTM D2344. "Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates."
22. ASTM D3039. "Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials."
23. BS – 476- Various parts for FRP

4. **NORMAL SERVICE CONDITIONS :**

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

I.	Ambient Air Temperature	: 40° C
II.	Maximum ambient air temperature	: 50° C
III.	Maximum air temp. in shade	: 45° C
IV.	Minimum air temp. in shade	: 0° C
V.	Relative humidity in percentage	: 10 to 100
VI.	Maximum annual rainfall	: 1500 mm
VII.	Wind Pressure (Max.)	: 100 Kg/m²
VIII.	Maximum altitude above sea level	: 1000 Meters
IX.	Normal climate	: Moderate hot and humid and polluted by dust & smoke.

As the Gujarat state is having large area,with a long seashore having saline atmosphere. The ABEB Switches, if installed in such area, shall be able to function satisfactorily.

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

The 11 KV ABEB Switches covered in this specification shall meet the guaranteed technical particulars mentioned in Annexure 'A', Part-1.

6. **DISTRIBUTION NETWORK ELECTRICAL PARAMETERS**

The main parameters of the distribution network are as follows:

I.	Rated Voltage	12 KV
II.	Nominal system voltage:	11 kV (rms)
III.	Highest system voltage:	12 kV (rms)
IV.	Number of phases:	3
V.	Frequency:	50 Hz±3% Hz
VI.	Type of earthing:	Solid
VII.	Power frequency withstand voltage:	28 kV
VIII.	Basic impulse withstand voltage:	75 kV

7. **CURRENT DENSITY:**

Current density to be adopted for all parts of ABEB Switches, terminal connectors and Earthing Blade shall not exceed the following limits.

I. Copper : 2.00 Amp. / sq.mm.
II. Aluminum Alloy : 1.25 Amp. / sq.mm.
III. Gun Metal Base : 1.63 Amp/ sq.mm.

8. **CONSTRUCTIONAL FEATURES:**

The ABEB Switches shall have triple pole construction and shall be suitable for vertical mounting For 11 KV ABEB Switch, there shall be two 11 KV Polymeric Insulator having minimum 320 CD, mounted on 75 X 40 X 6 mm FRP Channels per phase.

The aforesaid channel with the AB switchshall be mounted on anFRP frame, made of two channel supports. The switch pole shall be operable individually, i.e. phase wise. The main blade is fixed with an operating hook, where the flower head of the operating rod can be inserted and connect or detach the moving blade, as per the requirement.

The Earth Part shall constitute of a female contact mounted on a moving metallic arm, which can travel to 180^0. A construction is made for making alignment with the main blade, so that, when the main blade is in 'OFF' mode, the earth blade female part contactor fixes on it, manually. The metallic base of the earth blade component is solidly earthed in common using a 50X6mm GI strip as per the drawing.

The rating of ABEB shall be suitable for operation on three phase, three wire, 11 KV, 50 cycles, A.C. System with short-time current rating of 16KA for 1 seconds.

8.1 11 KV Polymeric Insulators to be used in manufacturing of ABEB Switches should be confirming to IEC:61109 or any other relevant IS/IEC, and as mentioned therein, with the latest amendment. The Bidder shall submit type test reports as per IEC: 61109 or any other relevant IS/IEC from NABL Approved Laboratory along with the bid.

8.2 The AB part 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 :

Element	Percent (%)
I. Copper (Min.) including silver & oxygen	: 99.90
II. Bismuth (Max.)	: 00.001
III. Lead Max.	: 00.005
IV. Total of all impurities excluding silver and Oxygen (Max.)	: 00.003

Further, the ABEB part contacts must be silver/Tin plated, with thickness of a coating not less than 2.5 Micron. The male and female contacts from electrolytic copper will have to be mounted on the Copper Alloy base.

8.3 The spacing between the phases shall be adjustable between 600mm to 700mm (Minimum) for 11 KV switch.

8.4 For the fixing components :

Bolts, Nuts, Washers etc. All Nuts, Bolts and washers of Above M10 shall be Hot Dip Galvanized of 5.6 Grade in accordance with the IS: 2633 with latest amendment, if any; All Nuts, Bolts and washers of M10 and of smaller size shall be of Stainless Steel

8.5 The Switch shall be provided with aluminum lug type terminal connector made of Aluminum material, with the long barrel, long palm with two holes separated by 30 mm and bimetallic Plate, suitable as per the requirement of DOG conductor size as per the attached drawing

8.6 AB Switch with Earth Switch:

The switch shall consist of 400 Amp rating switches, each with integral earth switches.The switch shall be designed with a specific design, separating both the mechanism: normal operation and the Earth section; to prevent the main and earth switch being switched "ON" at the same time. Mechanical interlocks shall be provided as mentioned in the drawing.

The isolating distance between the OFF and the ON position in the switch should be sufficient to withstand dielectric test as per IS/IEC, so as to have enough isolating distance for ensuring safety during testing and operation.

- Manually Operated 12 KV, 400A switch and Earthing Switch with continuous current rating capacity.
- Termination shall be suitable for the size, up to the size of the dog conductor.

Necessary arrangements shall be provided on the switch for selecting 'Earth' position. The systems shall prevent the ABEB switch functioning from being operated from the "ON" to "Earth On" position without going through the "OFF" position.

8.7 Technical Specification of ABEB

I.	Nos. of Phases	- 3
II.	Nos. of Poles	- 3
III.	Rated Voltage	- 12 KV
IV.	Operating Voltage	- 11 KV
V.	Rated lightning impulse withstand voltage	- 75 KV
VI.	Rated power frequency withstand voltage	- 28 KV
VII.	Current Carrying Capacity	- 400 Amps
VIII.	Short time rating current for 1 Seconds	- 16 KA
IX.	Rated peak withstand current	- 40 KA

8.8 Accessories and Spare:

Spares and accessories shall be supplied along with the main equipment at free of costs. ABEB switch blade shall be locked in ON Position which can be delatch by operating rod hook only from ground level and it shall be locked during ON condition itself.

Display Board for operating instruction as per the tender drawing shall be supply with each switch

8.9 FRP Channel:

FRP Channel shall be manufactured in accordance with NEMA FG-1 and ASTM –E84 /IS-6746 standards and others relevant standards.

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Channel shall be made of Glass reinforced Flame retardant vinylester (minimum Glass content 55%) and should be corrosion resistant and Fire retardant (Class 1, Fire rating) in accordance with the latest ASTM E-84/IS-6746. It shall have flame spread rating of 25 or less (class 1 rating) when tested in accordance with ASTM E 84/ASTM D635.

All FRP channelsshall be manufactured using the PULTRUSION technology

Glass content shall be maintained between 55% to 60% by weight in all pultruded components.

Composite material shall have ultraviolet light inhibiting chemical additive to resist UV degradation. All pultruded material shall be Nexus (or equivalent) surfacing veil to provide maximum chemical and UV protection.

The Composite FRP channel shall be supplied with Drilling / Perforation as per mention in drawing.

The channel shall be supplied in standard lengths mention as per attached drawings.

The Channel construction shall have high degree of finish and shall be such as to facilitate easy handling as also to ensure easy installation of ABEB without causing damage.

The inside surface shall be perfectly smooth and free from sharp edges, burrs or projections, etc. Only machine Molding is acceptable in both the sides.

The hardware shall conform to NEMA FG-1 and shall be able to withstand the loading.

Tolerance on width and length shall be +/- 6mm and height +/- 2mm for channel.

Appropriate coating of polyurethane shall be provided on FRP Channel for its better life.

The Color of channel and its accessories shall be yellow.

Design adequate separation between 11 KV Side Switch "ON"&"Earthing"

The bidder shall require to confirm the GTPs for FRP Channel as per Annexure-A, Part-2.

9. **QUALITY CONTROL :**

The manufacturers shall assure proper quality control for the manufacture of ABEB Switch, a tolerance of±5% in dimensions is allowed except for **(current carrying parts and FRP Channel).**Tolerance for FRP Chanel shall be as stated in Cl. 8.9 above and +5% in dimensions is allowed for current carrying parts.

The successful bidder shall invariably furnish following information along with offer/offer of inspection and testing of proto type sample.

I. Statement giving list of important raw materials including but not limited to
   a) Contact material
   b) Insulation
   c) Sealing material
   d) Contactor
   e) FRP

   Name of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of test normally carried out on raw materials in presence of Bidder's representative, copies of test certificates.

II. Information and copies of test certificates as in (I) above, in respect of bought out accessories& raw materials.

III. List of areas in manufacturing process, where stage inspections are to be carried out.

IV. Normally carried out for quality control and details of such tests and Inspections.

V. Special features provided in the equipment to make it maintenance free.

VI. List of testing equipment available with the Bidder for final testing of ABEB and associated combinations vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in the relevant schedule i.e. schedule of deviations from specified test requirements. The supplier shall, within 15

days from the date of receipt of Purchase Order, submit following information to the DISCOM.

a) List of raw materials as well bought out accessories and the names of sub-suppliers selected from those, be furnished along with offer.

b) Necessary test certificates of the raw material and bought out accessories.

c) Quality Assurance Plan (QAP) with the hold points for DISCOM's inspection. The quality assurance plan and hold points shall be discussed between the DISCOM and supplier before the QAP is finalized.

The supplier shall submit the routine test certificates of bought out items and raw material, at the time of routine testing of the fully assembled Switches.

10. TESTING & INSPECTION:-

10.1 TYPE TEST:-

The ABEB switches shall be subjected to the following type tests in accordance with the clause No. 6 of IS-62271-102:2003.

(i) Tests to prove that the temperature rise of any parts does not exceed the values specified in part-2 of this standard.

(ii) Tests to prove the capability of the switch to carry the rated peak withstand current and the rated short time current.

(iii) Tests to verify the insulation level including withstand tests at power frequency voltages on auxiliary equipment.

(iv) Tests to prove satisfactory operation and Mechanical endurance.

(v) Temperature Rise Test.

(vi) The type test certificate should not be more than 7years old as on due date of opening of tender.

The FRP Pultruded Sections used shall be fully type tested for Mechanical Properties, Electrical Properties, Fire Propagation, low flammability Fire Rating & Specific Optical Density of Smoke as mention above standards.Test certificate confirming the same shall have to be submitted along with the offer.