

# **TECHNICAL SPECIFICATION FOR THE 11 KV 400A (CONVENTIONAL ) DOUBLE BREAK AB SWITCHES WITH INSULATORS**

## **1. SCOPE:**

The specification provides for the manufacture, testing before dispatch, supply and delivery at destination stores of 3 phase 11 KV 400A(Conv.) AB Switches complete with Insulators for use on Lines and Sub-Stations as per the particulars given in the schedule and drawing attached.

## **2. STANDARDS:**

The switches shall conform in all respect to the IS:1818/1972, IS:9920 Parts I to IV (Latest Version) and IS:9921 Parts I to IV (Latest Version) and latest amendments thereof. The 11kV 400A AB Switches with Insulators shall also conform to REC Specification No.43 of 1987. The AB Switches with Insulators shall be suitable for horizontal upright mounting.

## **3. CLIMATE CONDITIONS:**

The climatic conditions under which the equipment shall operate satisfactorily are as indicated in Clause 23.1 of General and Financial terms and conditions for supply of materials.

## **4. RATINGS:**

- |  |              |
|--|--------------|
| a) Nominal System Voltage                  | : 11 KV      |
| b) Rated Voltage                           | : 12 KV      |
| c) Rated impulse withstand Voltage         | : 75 KV      |
| d) Rated frequency                         | : 50 Hz      |
| e) Rated current                           | : 400A Conv. |
| f) Rated peak short circuit current        | : 40KA       |
| g) Rated short time current                | : 16KA       |
| i) Rated maximum duration of short circuit | : 1 second   |

## **5. LIMITS OF TEMPERATURE RISE:**

The limits of temperature rise shall be as given in Table 4 of IS:1818/1972 and the reference conditions mentioned therein.

## **6. CONSTRUCTION: ( 11 KV 400 A AB SWITCHES WITH INSULATORS)**

- 6.1. The Air Break switches shall have 3 pole gang operated center post rotating type, double break horizontal mounted AB Switch with insulators as specified in Section – IV. All ferrous parts except those of stainless steel shall be hot dip galvanized. All nuts & MS Bolts other than stainless steel shall be galvanized properly conforming to IS: 2633 ( Latest Version). The threads of nuts and tapped holes cut after the galvanization shall be well oiled or greased.
- 6.2. The switches are meant for mounting on structures at a height of 6.1 to 7.32 meters from ground level. All the rotating parts, the ball crank lever and the fork at the end of operating pipe shall be made of mild steel or forged but not cast. This shall be clearly confirmed in the tender specification.
- 6.3. i) **BLADES:** The blades shall be best hard drawn electrolytic copper strip / extruded hollow copper tube of the same quality and shall be capable of carrying rated current continuously and the fault current, safely at all times without exceeding the temperature . The contact end shall be tin coated.

ii) **FIXED CONTACT:** The fixed contact element shall be made of rolled/ extruded electrolytic grade copper flat and with flexible ends, where required shall be made from soft electrolytic grade copper sheet. The contacts assembly shall be so designed that while carrying the rated continuous current, the temperature rise does not increase beyond the value specified in IS i.e. 40 Degrees Centigrade above ambient. The contact shall be self – release jaw – type and suitable stainless steel springs of sufficient pressure, shall be provided to ensure proper contact in the closing position.

Fixed contacts shall be provided with 2 sets of stainless steel ( non-magnetic) springs each on either side of fixed contact blades so that smooth contact is made for making and breaking contact.

Fixed and moving contacts shall be designed to carry current with current density of 2 Amps/ Sq.mm.

All bolts used in the current path of switch contact shall be of stainless steel

iii) **ARCING HORNS:** The AB (Air Break) Switch shall be provided with 3 sets of removable rod type arcing horn with “Make Before” and “Break after” feature. Arcing horns of GI material one set per each phase shall be provided. The diameter of the arcing horn rods shall be not less than 6mm for 11kV 400A Conv.

iv) **SWITCH TERMINALS:** The terminal pad shall be made of rolled / extruded electrolytic grade copper flat having a cross sectional area equal to that of the blade. It shall be constructed that an intimate contact with the contact element is ensured in case of 11kV 400A. The connector to the switch terminal shall be suitable for ACSR conductor. The aluminium connectors of appropriate size shall be supplied for each end and for each phase of the switch.

v) **BEARING:** Gun metal bush bearing of a reputed make is to be used for 11kV 400A Conv. AB Switches. The bushing should be got approved by competent authority.

Each rotating insulator stack shall have thrust roller bearings and shall rotate into gun metal bush bearings contained in a suitable weather proof housing. The housing shall be fitted with the greasing nipple.

vi) **PHASE COUPLING BAR:** The bar required for coupling the rotation of the 3-Phases should be fixed in a manner to permit the smooth movement for operation of Switches.

- 6.4. The leakage current shall pass to earth and not between terminals of the same pole or between poles. A reliable earthing terminal having a clamping bolt of at least 12mm dia. provided on the frame at one end of the isolator shall be provided. It shall be marked with the earth symbol in indelible manner on / or adjacent to the terminal.
- 6.5. The operating mechanism shall be suitable for normal operation by one man without undue effort.

This shall comprise of operating pipe of dia 32mm (NB) for 11kV and length 6.0 meters with intermediate coupling and operating handle. The mechanism shall provide adequate mechanical leverage with minimum of loose/lost motion. The pipe shall conform to medium class GI pipe of IS: 1239 (Latest Version). The AB Switches shall be constructed in such a manner to permit pad locking in both open position and closing position and also with mechanical stopper in open and closing position. A pad lock of reputed make shall be provided. **The operating handle shall be duly insulated with material such as special compound latex (other than super compound latex the material should be got approval with EPDCL) to ensure safety to the operating personals**

- 6.6. **BOLTS & NUTS:** The required bolts, nuts, washers etc. for assembling the complete – air – break switch for fixing the insulators to the metallic parts of AB Switch at both top and bottom and for fixing the AB Switch to the structure shall be supplied with the equipment

at no extra cost. Bolts and nuts shall be provided with lock- washers and lock – nuts whenever required. All the bolts and nuts used in the current path shall be of stainless steel.

6.7. The clearance shall be as given below:

- a) Phase clearance ( i.e. center to center distance between : 914.4 mm  
the insulators of adjacent phase in the assembled  
position of the switch)
- b) Center to center distance between insulators of the : 457.2 mm  
consecutive poles of the same phase in the assembled  
position of the switch
- c) Minimum clearance between phases for any position of the Switch : 457.2mm

There should be adequate clearance between HG Fuse set and AB Switches operating handle when the switch is erected on a transformer structure.

6.8. **LOCKING ARRANGEMENTS:** The AB (Air Break) switches shall be constructed in such a manner to permit pad locking in both open and close position. A pad lock of reputed make shall be provided.

6.9. **GALVANIZING:** All ferrous parts should invariably be hot dip galvanized. However, the bolts, nuts, washers, spring washers and split pins, which can be electro galvanized. The threads of nuts and tapped holes that shall be cut after the galvanization shall be well oiled or greased.

## 7. **SUPPLY OF AB SWITCHES WITH POST TYPE INSULATORS:**

7.1. The insulators for the isolating switches shall be of porcelain post type and shall be in accordance with IS: 2544 and IS : 5350 ( Part – I to IV) latest version. The assembly of the metal parts and porcelain shall be such a manner that the metal and porcelain part shall not have any deteriorating effect or create undue stresses adversely effecting the mechanical and electrical strength of the unit arising out from any harmful expansion. **The insulators shall be invariably procured from registered vendors of EPDCL only.**

7.2. **GENERAL REQUIREMENTS:** The porcelain shall be sound, free from defects, thoroughly verified and smoothly glazed.

Unless otherwise specified, the glaze shall be brown in colour. The glaze shall cover all the exposed porcelain parts of the insulator except those areas, which serve as supports during firing and required to be left un-glazed.

Precautions shall be taken during design and manufacture to avoid the following:

- a) Stresses due to expansion and contraction, which may lead to deterioration.
- b) Stress concentration due to direct engagement of the porcelain with the metal fittings.
- c) Retention of water in the recesses of metal fittings, and
- d) Shapes, which do not facilitate easy cleaning by normal methods.

7.3. Cement used in the construction of post insulators shall not cause fracture by expansion or loosening by contraction and proper care shall be taken to locate correctly the individual parts during cementing. The cement shall not give rise to chemical reaction with metal fittings, and its thickness shall be as uniform as possible.

7.4. The threads of tapped holes in the post insulator metal fittings shall be cut after giving anti – corrosive protection and shall be protected against rust by greasing or other similar means.

Following make are approved by EPDCL.

1. M/s. Jayashree Insulators (J.S.I.) - Rishra / Halol.

2. M/s. W.S. Insulators (India) Ltd., - Madras (W.S.I.).
3. M/s. Bharat Heavy Electrical Ltd.,-Bangalore/Jabalpur(BHEL).
4. M/s. Seshasayee Industries Ltd., - Vadalur, Madras.
5. M/s. Allied Ceramics – Calcutta.
6. M/s Agarwal Salt Co.,Bikanr.
7. M/s Bikaner Porcelain Pvt. Ltd.,Bikaner.
8. M/s Jaipur Glass & Potteries,Jaipur.
9. M/s Vishal Maleable Ltd.,Ankleshwar.
10. M/s Prime Insulators Pvt. Ltd.,Himatnagar.

If any other make of 11 KV Solid Core Insulators are to be used, then it should be got approved from EPDCL .

**7.5. TESTS :** The insulators shall comply with the relevant tests as specified in IS : 2544.

**7.6. MARKING:** Each insulator shall be legibly and indelibly marked to show the following:

- a) Name or trade mark of the manufacturer
- b) Month and year of manufacturer
- c) Minimum failing load in Newtons
- d) ISI, Certification mark, if any

Marking on porcelain shall be printed and shall be applied before firing.

## **8.0. TESTS:**

- a. The following tests shall be carried out as per IS: 1818/1972 on complete isolators and their operating devices.

**8.1.1. TYPE TEST:** The following shall constitute the type tests.

- a) Impulse voltage dry test.
- b) Power frequency voltage dry test on main circuits.
- c) Power frequency voltage wet test on main circuits.
- d) Temperature rise test of the main circuits.
- e) Measurement of the resistance of the main circuits.
- f) Test to prove capability of carrying the rated peak short circuit current and the rated short time current.
- g) Operation test.
- h) Mechanical endurance test.

**NOTE:** All the above tests shall be conducted **at NABL accredited laboratory** as per the relevant IS Specification and a copy of the test report shall be furnished along with the tender.

**8.1.2. ROUTINE TEST:** The following shall comprise routine test:

- a. Measurement of resistance of the main circuit
- b. Test to prove satisfactory operation.

The ambient air – conditions during the test shall be as specified in IS.

## **9. MARKING:**

- a) AB Switches and their operating device shall be provided with the name plates in accordance with the Table 6 of IS : 1818 / 1972. The Name plate shall be adequate weather and corrosion proof.
- b) The name plate should be fitted in a position where it can be visible in normal service and installation.
- c) If the AB Switch consist of several independent poles, each pole shall be provided with the name plate.
- d) The name plate shall be marked with the following
  - a. Name of manufacturer
  - b. Name of the product
  - c. EPDCL Purchase Order Number & Date

- d. Manufacturers month & Year
- e. EPDCL Logo shall be embossed on plate and should be completely welded

**10. INSPECTION:**

- 10.1. All routine tests and inspection for acceptance tests shall be made at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and 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.
- 10.2. The purchaser has the right to have the tests carried out at suppliers cost by an independent agency wherever there is a dispute regarding the quality of supply.

**11. PACKING:**

The air-break switches shall be delivered suitably packed. Although the method of packing is left to the discretion of the manufacturer, it should be robust for rough handling that is occasioned during transportation by rail / road.

**12. DRAWING:**

Two sets of detailed dimensional drawings of each part of the complete air break switches along with operating instructions shall have to be submitted along with the tender.

**13. GUARANTEED TECHNICAL PARTICULARS:**

The Guaranteed Technical Particulars of the air break switches shall be given by the bidder as per Annexure - I.

**14. THE SCHEDULE OF REQUIREMENT, DESIRED DELIVERY AND PRICES:**

- 14.1. The Schedule of requirements and desired deliveries are indicated in Section – IV.
- 14.2. The schedule of prices shall be indicated as per Price Schedule for AB switches with Insulators.

**15. GENERAL:**

- 15.1 Any design other than the one so specified herein may also be offered specification.
- 15.2 A fully dimensioned sketch showing the full details of gang operation fixed and moving contacts should necessarily accompany the tender.
- 15.3 A neat dimensioned sketch showing the details of the switch should accompany the tender.

NOTE: 1. The tenderer shall follow the dimensions while manufacturing of AB switches shown in the drawing enclosed to the specification.

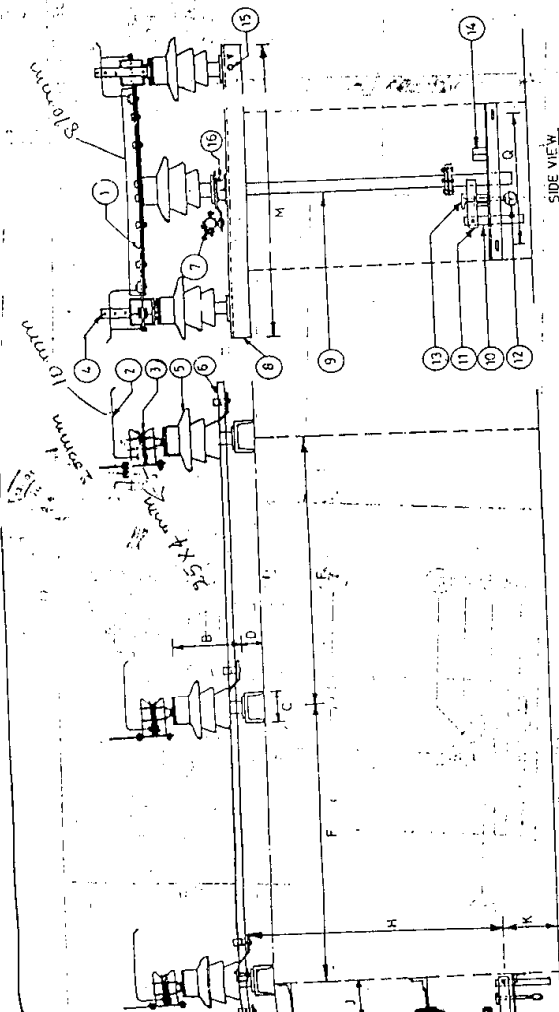
11KV 400A (Conv.) AB Switch

**REFERENCE**

1. MOVING CONTACT 32 X 6 MM H.D.C. FLAT
2. ARCHING HORN 10 MM Ø G.I. ROD
3. FIXED CONTACT 75 X 4 MM H.D.C. FLAT
4. JUMPER PAD 32 X 6 MM H.D.C. FLAT
5. INSULATOR STACK POST INSULATOR
6. TANDEM PIPE G.I. PIPE 25 Ø
7. PHASE COUPLER CLAMP M.S. FABRICATED
8. ISOLATOR BASE M.S. CHANNEL 100 X 50 MM
9. OPERATING DOWN PIPE G.I. PIPE 32 Ø
10. OPERATING HANDLE G.I. PIPE 32 Ø
11. OPERATING MECHANISM M.S. FABRICATED
12. LOCKING PIN G.I. ROD 12 MM Ø
13. PAD LOCK
14. SAFETY STOPPER M.S. ANGLE
15. EARTH BOLT G.I. 12 MM BOLT
16. GREASE NIPPLE

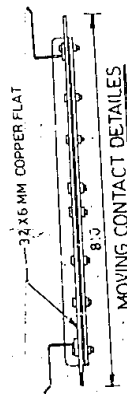
**NOTE**

1. ALL DIMENSIONS ARE IN MM
2. ALL FERROUS PARTS ARE HOT DIP GALVANISED
3. CONTACT ENDS ARE TIN PLATED
4. TOLERANCE OF DIMENSIONS ± 5%.

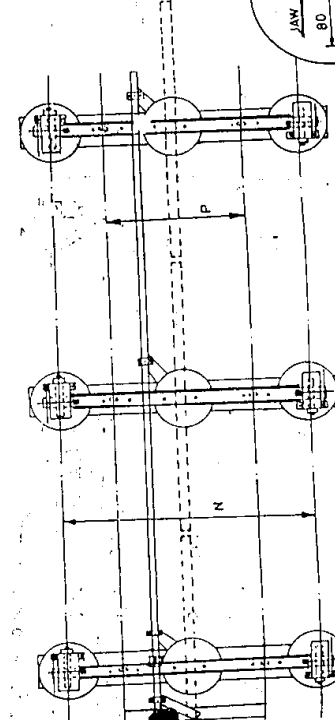


**ELEVATION**

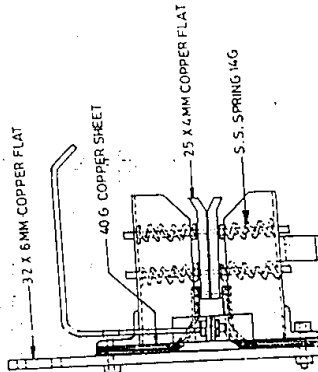
**SIDE VIEW**



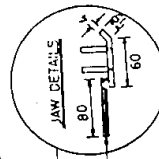
**MOVING CONTACT DETAILS**



**PLAN**



**FIXED CONTACT DETAILS**



**JAW DETAILS**

31 NOS OF 40 G SHEET

VOLTAGE	INSULATOR PER STACK	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
11KV 400A	ONE NO. 11KV INSULATOR	254	100	50		920					1000	1800	750	400	180		

Sd/- M. KRISHNACHARYULU  
Chief General Manager  
P&MM  
A.P.E.P.D.C.LTD.  
VISAKHAPATNAM

**GUARANTEED TECHNICAL PARTICULARS****11 KV 400A (CONVENTIONAL ) DOUBLE BREAK AB SWITCHES WITH INSULATORS**

<b>Sl.No.</b>	<b>DETAILS</b>	<b>GUARANTEED PARTICULARS</b>
	<b>AIR BREAK SWITCHES</b>	
1	Name of the manufacturer	
2	Whether single break or double break	
3	No. of poles	
4	Frequency	
5	Voltage rating	
6	Current rating in Amps	
7	Temperature rise of the following at full rated current in °C over ambient temperature	
8	Whether contacts are silver coated or tin quoted along with thickness of coating in mm	
9	Voltage drop across terminals of poles	
10	Short time current and duration	
11	Material of fixed contact	
12	Material of moving blade	
13	Material of terminal connector	
14	Type diameter and length of operating handle	
15	Material of arcing horns	
16	Size and length of base mounting channel	
17	Whether the air break switch is complete with all accessories	
18	Whether dimensional drawings are enclosed with the tender	
19	Minimum clearance between phases (the center distance between the insulators of adjacent phases in the assembled position of switch)	
20	Center to Centre distance between the insulators of the consecutive poles of the same phase in the assembled position of switch	
21	Whether mechanical inter lock has been provided for arcing switches	
22	Type of bearings use in: a. Rotating insulator stack. b. Operating Shaft.	
23	Impulse with stand voltage with 1/50 MS wave positive and negative polarity i) Across Isolating Distance ii) To earth and between poles	
24	One minute power frequency with stand voltage across isolating distance to earth and between poles	

Sl.No.	DETAILS	GUARANTEED PARTICULARS
<b>II</b>	<b>PARTICULARS OF INSULATORS</b>	
1	a) Type of Insulator b) Name of manufacturer of Insulators c) Height of the Insulator d) Diameter of the smallest shell e) No. of units per stack	
2	<b>ELECTRICAL CHARACTERISTICS:</b> a) Flash over Voltage b) Dry Power Frequency c) Wet Power Frequency d) Impulse Voltage of 1/50 micro-seconds(+ve) e) Impulse Voltage of 1/50 micro-seconds(-ve) f) Withstand Voltage i) Dry Power Frequency ii) Wet Power Frequency iii) Impulse Voltage of 1/50 micro-seconds(+ve) iv) Impulse Voltage of 1/50 micro-seconds(-ve)	
3	Power frequency puncture withstand voltage of unit	
4	<b>Mechanical Characteristics:</b> a) Cantilever strength upright b) Cantilever strength under hang c) Torsional strength d) Tensile strength	
5	<b>General Characteristics:</b> a) Minimum creepage distance b) Weight of complete unit	
6	Standard to which insulator conforms:	

NOTE: Value should be given in Metric Units