

TECHNICAL SPECIFICATION FOR THE 33 KV 800A CONVENTIONAL DOUBLE BREAK AB SWITCHES WITH INSULATORS

1. SCOPE:

The specification provides for the manufacture, testing before dispatch, supply and delivery in full shape at destination stores of 3 phase 33KV 800A No Load AB Switches with Insulators for use on lines and Sub – Stations as per the particulars given in the schedule 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:2544 and IS:5350 Parts I to IV (Latest Version)for Porcelain Insulators.

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	: 33 KV
b) Rated Voltage	: 36 KV
c) Rated impulse withstand Voltage	: 170 KV
d) Rated frequency	: 50 Hz
e) Rated current	: 800A (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: (33 KV 800A AB SWITCHES WITH INSULATORS)

- 6.1. The Air Break switches shall have 3 pole gang operated double break type as specified in Section – IV. All ferrous parts except those 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. The bimetallic terminal connectors groove shall be suitable to accommodate 200 Sq mm AAA conductor
- 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 quotation.
- 6.3. i) BLADES: The blades shall be best hard drawn electrolytic copper strip / extruded hollow copper tube of the same quality and be capable of carrying rated current continuously and the fault current, with safety at all times. The contact end shall be tin coated up to 400A, silver plating of 12 to 15 microns for above 400A AB Switches.

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 4 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. and fixed and moving contact clamps shall be rust free.

All bolts used in the current path of switch contacts 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 for each phase shall be provided. The diameter of the arcing horn rods shall be not less than 10mm for 33kV 800A.

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 so constructed that an intimate contact with the contact element is ensured in case of 33kV 800A. 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:** The rotating stack shall be supported with ball bearings, guide bearing to ensure smooth operation of 33kV 800A.

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 atleast 12mm dia provided on the framed at one end of the isolator shall be provided. It shall be marked with the earth symbol (1) 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 40mm (NB) for 33kV 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 and closing position and also with a mechanical stopper in open and closing position. **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 **MECHANICAL STRENGTH:** The isolating switches shall be capable for with standing the rated mechanical terminal loads and electro magnetic forces, without effecting the operation and current carrying properties. The Switches, complete with the operating

mechanism should not come out of their own in closed position due to the effect of the gravity, wind pressure, vibrations and reasonable shocks. Their construction should be such that they do not open under the influence of the short circuit current.

6.7 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 structures shall be supplied with the equipment at no extra cost. Bolts and nuts shall be provided with lock- washers and lock – nuts wherever required.

6.8 The clearance shall be as given below:

- a) Phase clearance (i.e. center to center distance : 1524 mm
between the insulators of adjacent phase in the
assembled position of the Switch)
- b) Center to center distance between insulators of the : 457.5 mm
consecutive poles of the same phase in the assembled
position of the switch
- c) Minimum clearance between phases for any position : 610 mm
of the Switch

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

6.9 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.

6.10 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 SOLID CORE INSULATORS:

7.1 The insulators for the isolating switches shall be solid core 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 in 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 vitrified 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 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.

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:

8.1. 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 shall be made at the place of manufacturer unless otherwise especially 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 whenever 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. GENERAL:

- 14.1 Only standard Solid Core Insulators (preferably of JSI, Calcutta/IEC, Bhopal/AC, Calcutta/ IP, Calcutta/VCI, Warangal/BHEL, Bangalore or from any standard manufacturer having CPRI type test certificates with prior approval of APEPDCL are to be used in these manufacture of Switches and not Pin type Insulators with local cementing. This shall be clearly confirmed in the tender.
- 14.2 Any design other than the one so specified herein may also be offered . However APEPDCL reserves the right to make purchase only according to this specification.
- 14.3 A fully dimensioned sketch showing the full details of gang operation, fixed and moving contacts should necessarily accompany the tender.
- 14.4 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.

15. All bids submitted will also include the following information:

- i. Copies of original documents defining the constitution or legal status, place of registration and principle place of business of the company or firm or partnership, etc.,
- ii. The bidder should furnish a brief write-up, backed with adequate data, explaining his available capacity and experience (both technical and commercial) for the manufacture and supply of the required equipment within the specified time of completion after meeting all their current commitments.
- iii. The bidder should clearly confirm that all the facilities exist in his factory for inspection and testing and these will be made available to the purchaser or his representative for inspection..

iv. Reports on financial standing of the Bidder such as profit and loss statement, balance sheets and auditor's report for the past three years, bankers certificates etc.

PART LIST

1. ARCING HORN (ø 10 ROD M.S. HDG)
2. FIXED CONTACT (2 Nos. 25 x 4mm Cu. STRIP)
3. TERMINAL CONNECTOR (SUITABLE FOR PANTHER CONDUCTOR)
4. JUMPER (75x10 ALUMINIUM FLAT)
5. ARCING HORN FIXING CLAMP (25x6 M.S. FLAT)
6. MOVING CONTACT ASSEMBLY (38 OD x 32 ID COPPER TUBE)
7. INSULATOR STACK (ANY STANDARD MAKE)
8. TANDEM PIPE (ø 25 G.I. PIPE)
9. BASE CHANNEL (100x50x6 mm CHANNEL M.S. HDG)
10. ROTATING STOOL BASE WITH LEVER ARM & CLAMP (M.S. HDG)
11. DOWN OPERATING PIPE (40 NB CLASS 'B' G.I. PIPE 5800 mm LG.)
12. OPERATING MECHANISM (MANUAL)
13. SUPPORTING STRUCTURE (NOT IN OUR SCOPE OF SUPPLY)
14. LOCKING PIN TO PREVENT ROTATION OF MOVING CONTACT (G.I.)
15. PROVISION FOR PADLOCK
16. DOWN PIPE BRACKET ANGLE 40x40x5mm
17. TANDEM PIPE CLAMPS 30x6mm
18. OPERATING HANDLE 40mm OD GI PIPE

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. ALL FERROUS PARTS ARE HOT DIP GALVANIZED
3. ALL NON FERROUS CONTACT POINTS ARE TIN PLATED (15 MICRONS MIN)
4. THE INDICATED DIMENSIONS ARE SUBJECTED TO THE MANUFACTURING TOLERANCE:
UP TO 50 mm \pm 3% ; 51 TO 100 mm \pm 2%
101 TO 300 mm \pm 1% ; ABOVE 300 mm \pm 0.5%
5. MAIN ROTATING POST HAVING THRUST BALL BEARINGS.
MAKE : HMT / TATA / SKF

WEIGHT
NET WEIGHT OF THE ISOLATOR
INCLUDING INSULATOR : 0.18 MT (Approx.)

CUSTOMER : APEPCL, Vishnukapatham.

PO No. :

33KV 800 A, TRIPLE POLE, DOUBLE BREAK,
BANGING TYPE AB SWITCHES

SCALE : N.T.S.

DATE

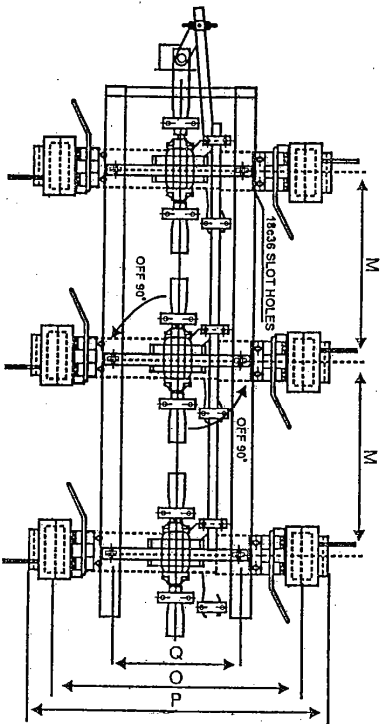
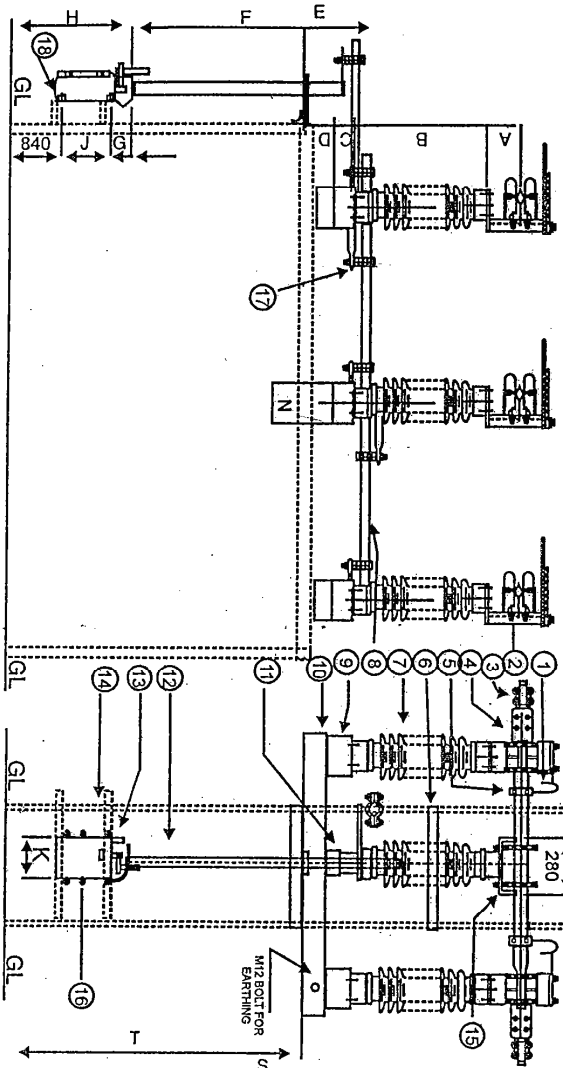
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SHEW

DRAW No. SHEW/11-12



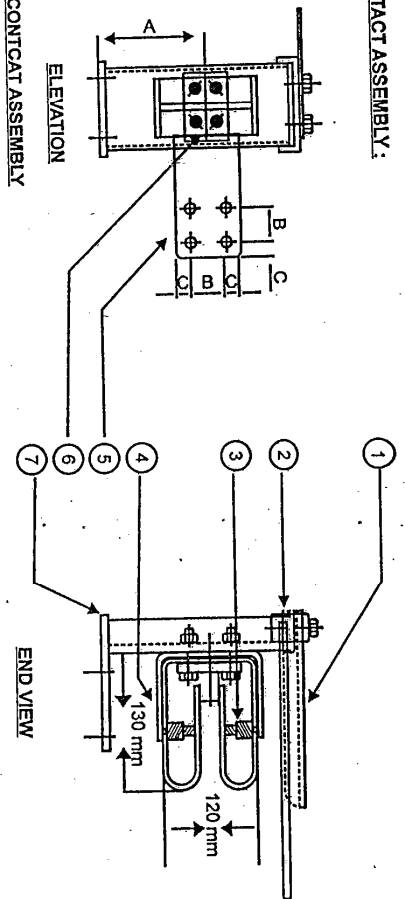
PLAN

DIMENSIONS

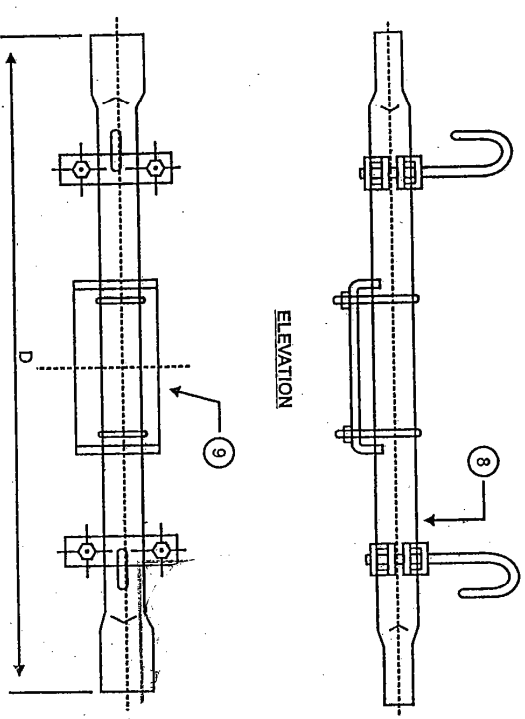
A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	S	T
125	508	50	50	380	5800	150	1200	210	290	1524	100	915	1065	394		115	2800

REVISIONS	D	C	B	A

FIXED CONTACT ASSEMBLY:



MOVING CONTACT ASSEMBLY



PART LIST

1. HOOD (M/S HDG)
2. ARCING HORNS (ø 10 ROD M/S HDG)
3. SPRINGS (STAINLESS STEEL)
4. JAWS (25 x 40x FLAT 2 Nos. T_{IN} PLATED)
5. JUMPER PLATE (75x10 mm THICK ALUMINUM FLAT)
6. SPACER
7. SUPPORTING CHANNEL (M/S HDG)
8. MOVING CONTACT (38 ODx32 ID HD EC TUBE) ENDS SILVER.
9. CENTER MECHANISM (M/S HDG)

NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. ALL FERROUS PARTS ARE HOT DIP GALVANIZED.
3. ALL NON FERROUS CONTACT POINTS ARE T_{IN} PLATED NOT LESS THAN 15 MICRONS)
4. THE MOVING CONTACT ASSSEMBLY SHOWN IS FOR HANGING TYPE ASSEMBLY

DIMENSION			
A	B	C	D
125	40	30	1015.

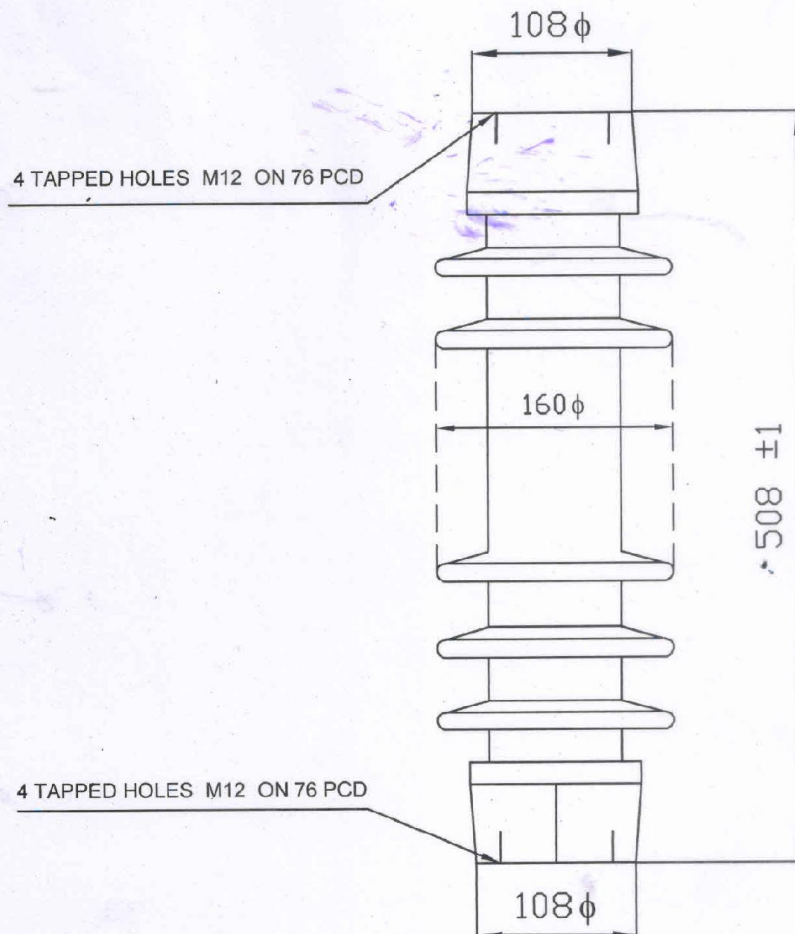
REVISIONS			
D	C	B	A


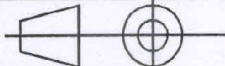
CUSTOMER : APEPDL, Veshakapattanam.

PO No. :

MOVING & FIXED CONTACT ASSEMBLY
33KV 800 A

SCALE : N.T.S.	
DATE	
DRAWN	
CHECKED	
APPROVED	SHEW
DRAW No. SHEW/8-11-12	



ELECTRICAL CHARACTERISTICS					MECHANICAL CHARACTERISTICS		GENERAL	
<div>a. Flash Over Voltage125 KV</div> <div>b. Dry Power Frequency100 KV</div> <div>c. Wet Power Frequency210 Kvp</div> <div>d. Impluse Voltage Of 1/50 Micro-Seconds (+Ve)225 Kvp</div> <div>e. Impluse Voltage Of 1/50 Micro-Seconds (-Ve)175 Kvp</div> <div>f. With Stand Voltage</div> <div> i) Dry Voltage100 KV</div> <div> ii) Wet Voltage80 KV</div> <div> iii) Impluse Voltage Of 1/50 Micro-Seconds (+Ve)225 Kvp</div> <div> iv) Impluse Voltage Of 1/50 Micro-Seconds (-Ve)175 Kvp</div> <div>g. Power Frequency Puncture Withstand Voltage Of Unit</div>					<div>a. CANTILEVER STRENGTH UPRIGHT450 kgf</div> <div>b. CANTILEVER STRENGTH UNDER HUNGNA</div> <div>c. TENSILE STRENGTH4000 kgf</div> <div>d. TORSIONAL STRENGTH250 kgfm</div>		<div>a. Minimum Creepage DistanceMM900</div> <div>b. Bolt Pitch Circle DiaMM76</div> <div>c. Colour Of GlazeBROWN</div>	
							<div>a. APPLICABLE STANDARD : IS 2544 ; IS 5350 IEC - 168</div> <div>b. All Ferrous Parts are HotDip Galvanised as per : IS 2633</div>	
REV 1		DATE	NAME	SIGN	CUSTOMER : AP EPDCL, VISAKAPATNAM PO NO : CGM / P&MM / EPDCL / VSP / P3 / CEMPT - 128 / 18 -19 / PM - 5402 / 19 ; DT. 05 - 03 - 2019			
	DRAWN	20-03-19	KS BABU					
	CHECKED	20-03-19	TSR					
	APPRD.	20-03-19	TSR					
ALL DIMENSIONS ARE IN MM UNLESS OTHER WISE MENTIONED					TITLE : 33 kV SOLIDCORE INSULATOR			
SCALE								
NTS								

ANNEXURE - I

**GUARANTEED TECHNICAL PARTICULARS FOR 33 KV 800A CONVENTIONAL
DOUBLE BREAK AB SWITCHES WITH INSULATORS**

Sl.No.	DETAILS	GUARANTEED PARTICULARS
	AIR BREAK SWITCHES	
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 i) Normal ii) Maximum with duration	
7	Temperature rise of the following at full rated current in °C over ambient temperature i) Copper contacts with coating ii) Terminals of switches intended to be bolted to the external conductors. iii) Metallic parts acting as springs	
8	Whether contacts are silver coated or tin coated 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 center distance between the insulators of consecutive poles of the same phase in the assembled position of switch (in mm)	
20	Whether mechanical inter lock has been provided for arcing switches	
21	Type of bearings use in: a. Rotating insulator stack. b. Operating shaft.	
22	Impulse with stand voltage with 1/50 MS wave positive and negative polarity	

	i) Across Isolating Distance ii) To earth and between poles	
23	One minute power frequency with stand voltage across isolating distance to earth and between poles	

Sl.No.	DETAILS	GUARANTEED PARTICULARS
II	PARTICULARS OF INSULATORS	
1	a) Type of Insulator b) Name of manufacturer of Insulators c) Height of the Insulator d) Diameter of the largest shell e) No. of units per stack	
2	ELECTRICAL CHARACTERISTICS: (For one Insulator) 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 Voltage ii) Wet Voltage 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	Mechanical Characteristics: a) Cantilever strength upright b) Cantilever strength under hang c) Torsional strength d) Tensile strength	
5	General Characteristics: a) Minimum creepage distance b) Weight of complete unit	
6	Standard to which insulator conforms: a) Minimum creepage distance b) Weight of complete unit:	

NOTE: Value should be given in Metric Units