TECHNICAL SPECIFICATION

OF

ELECTRICAL MATERIALS

(AB SWITCH)

"GROUP – A"

Tender Notice No. NESCO Utility / O&M Materials/58 / 8267, dtd.17.7.15

GROUP – A

AB Switch

Sl. No.	Item Description	Unit	Qty.
1	*33 KV 400 A AB Switch (Horizontal Type)*	No	50
2	*11 KV 400 A AB Switch (Horizontal Type)*	No	120

NB: 1. Bidders should put their authorized signature with office seal on each page of the documents.

2. Bidders should put their offer in the Guaranteed particulars column furnished in the tender documents.

3. Purchaser may ask to the bidder who will qualify in Techno- Commercial evaluation of the tenders for submission of Samples for verification , if required.

4. Purchaser reserves the right to increase or decrease the above quantities during placement of purchase order or may cancel any item/items without assigning any reason thereof .

Dy. General Manager (C&P)
NESCOUtility, Balasore, Odisha

TECHNICAL SPECIFICATION OF 33 KV & 11KV 3 POLE, 400 AMP , HORIZONTAL TYPE AB SWITCH

TECHNICAL SPECIFICATIONS FOR AB SWITCH

1. **SCOPE:-** This specification covers manufacturing testing and supply of 3 Pole, 400 AMP, 50 Hz, Single break, 33 KV & 11 KV class Air Break switches for outdoor installations to be used at 33/11 KV Sub-stations and for incoming & outgoing Lines suitable for operation under off load conditions.

1.1 DESCRIPTION OF THE MATERIALS:-The A.B. Switch sets shall confirm to the following parameters:-

Sl. No.	Description	Parameters of AB Switch	
		33 KV	11 KV
i)	Number of poles	3	
ii)	Number of Post insulator per pole	4 nos. 22/24 KV class	2 nos. 12 KV class
iii)	Nominal system voltage (KV)	33	11
iv)	Highest System Voltage (KV)	36	12
v)	Rated frequency	50HZ	
vI)	System earthing	Effectively earthed.	
vII)	Rated nominal current Amp.	400	400
viii)	Altitude of installation	Not exceeding 1000 M	

The post insulators used in the A.B. Switches shall have the following ratings

Sl.	Description	Parameters P.I. of AB Switches for	
		33 KV	**11 KV**
i)	Power frequency withstand voltage	95	35
ii)	Power frequency withstand voltage	75	35
	(wet) KV (RMS)		
iii)	Impulse withstand voltage (dry) KV		
iv)	Power frequency puncture	1.3 times the actual dry flashover voltage of the unit	

1.2 STANDARDS:- The AB Switch Set shall conform to the following standards:-

i) IS-9920 (Part-I to V.)

ii) IS-2544/1973 (for porcelain post insulators

iii) IS-2633 (for galvanization of ferrous parts.) or its latest amendments if any.

1.3 INSULATORS:-

12 KV class (for 11 KV AB Switches) and 22 KV / 24 KV class (for 33 KV AB Switches) Post Insulators complete with pedestal cap duly cemented to be used in the AB Switch Set conforming to IS-2544/1973

The bidder shall furnish the type test certificate of the post insulators from their manufacturer for reference.

The bidder shall mention make, type of insulation materials, metal fittings, Creep age distance, protected Creep age distance, tensile strength, compression strength, torsion strength and cantilever strength.

1.4 CLIMATIC CONDITIONS:-

The A.B. Switch set shall be suitable for operation under the following climatic Conditions

1. Maximum ambient air temperature. 45^{0} C

2.	Maximum daily average air temperature	35^0 C
3.	Maximum yearly average ambient air temperature	30^0 C
4.	Maximum temperature attainable by a body exposed to the sun.	50^0 C
5.	Minimum ambient air temperature	0^0 C
6.	Maximum relative humidity.	100%
7.	Minimum number of rainy days per annum	70
8.	Average number of rainy days per annum	120
9.	Average annual rain fall.	150 cm.
10.	Number of months of tropical monsoon conditions	4
11.	Maximum wind pressure.	260 Kg./ mm^2
12.	Degree of exposure to atmospheric pollution.	Normally polluted atmosphere.

1.5 TECHNICAL DETAILS:-

1.5.1 The 33 KV A.B. Switch Set shall be gang operated **(with double tandem pipe)** single air break outdoor type horizontal mounting having 4 nos. 22/24 KV post insulator per phase and the 11 KV A.B. Switch Set shall be gang operated single **(with double tandem pipe)** air break outdoor type horizontal mounting having 2 nos. 12 KV post insulator per phase. The operating mechanism shall be suitable for manual operation from the ground level and shall be so designed that all the three phases shall open or close simultaneously. The Switches shall be robust in construction, easy in operation and shall be protected against over travel or straining that might adversely affect any of its parts. The required base M.S. Channel, phase coupling rod, operating rod with intermediate guide braided with flexible electrolytic copper, tail piece of required current carrying capacity and operating mechanism with _ON' & _OFF' positions shall be provided. The operating rod shall be medium gauge of 32mm diameter nominal bore G.I. pipe single piece 6 meters. The phase coupling rod for gang operation shall medium gauge 25mm dia nominal bore G.I. Pipe. Rotating post insulators shall be provided with suitable bearing mounted on a base channel with 6 mm thick thrust collar and 6mm split pin made out of stainless steel. The operating down rod shall be coupled to the spindle (minimum dia - 32mm) for gang operation through another suitable bearing by two numbers 10mm dia through stainless steel bolts with double nuts. The post insulators should be fixed

with the base channel using Galvanized Nuts and Bolts.

All the bearings shall be provided with grease nipple. All ferrous parts shall be galvanized and polished. The pipes shall be galvanized in accordance with IS-4736/1968.

1.5.2 **Mounting: -** The A.B. Switches shall be suitable for horizontal mounting in all type of sub-station structures.

1.5.3 **Switching Blades**: - It shall be made out of electrolytic copper with silver plated. The approximate size shall be 250mm x 50 x 8mm for 11 KV. The switch shall have such a spring mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation.

1.5.4 **Fixed Contracts:**- The fixed jaw type female contracts (50x8x95)mm for 11 KV shall be made of electrolytic copper (minimum 95 % copper composition) duly electroplated controlled by Phosphor bronze high pressure spring housed in robust G.I. Cover.

It is essential that provision shall be made in fixed female contracts to take the shock arising from the closing of moving contract blade without the same being transmitted to the post insulator. The arrangement made in this regard shall be specifically shown in the drawing.

1.5.5 **Arcing Horn**:- As the switches are generally meant for isolating transmission line and distribution transformers, suitable arcing horns shall be provided for breaking the charging current horn shall be made of 10 mm dia G.I. Rod with spring assisted operation.

1.5.6 **Terminal Connectors**:- Terminal connectors shall be robust in design. The size of fixed connector shall be (80 x 50 x8 mm) and size of movable connector shall be of (80 x50) x (80 x 50) x 8 mm of copper casting with uniform machine finishing duly silver plated made out of minimum 95 % copper composition with 2 nos. 12 mm dia holes provided with suitable brass bolts and double nuts, flat washers & 2 nos. bimetallic solderless sockets suitable up to ACSR Panther or AAAC 232 mm^2 conductor.

1.5.7 **Spacing**:- The minimum clearance between phase to the switch shall be 1200 mm. The operating down rod shall be at a transverse distance of 300 mm from the outer limb of the

switch. The centre spacing between two post insulators of the same phase shall be 560 mm. In the open position of the A.B. Switches the moving blade shall rotate through anangle of 90^0 . This shall be exhibited in the drawing.

1.5.8 Drawing & Literatures:- Drawings of each item i.e. 11 KV, 400 amp and 33 KV 400 amp, 3 Pole, single break A.B. Switch shall be furnished along with the tender.

The details of construction and materials of different parts of the A.B. Switches shall clearly be indicated in the tender and illustrative pamphlet / literature for the same shall be submitted along with the tender.

1.6 TESTS & TEST CERTIFICATE

1.6.1 Type Test:- Certificates for the following type tests conducted within five years proceeding to the date of opening of tender on prototype set of A.B Switch in a Govt. Approved Testing Laboratory preferably at CPRI, Bhopal/ Bangalore shall have to be submitted for reference and scrutiny.

i. Impulse voltage dry test

ii. Power frequency voltage dry test

iii. Power frequency voltage wet test

iv. Temperature of resistance.

v. Measurement of resistance.

vi. Test to prove the capability of carrying the rated peak short circuit current and the rated short time current.

vii. Mainly active load breaking capacity test. viii. Transformer off-load breaking test.

ix. Line charging breaking capacity test.

x. Operation tests.

xi. Mechanical endurance test.

xii. Mechanical strength test for the post insulator as per IS-2544/1973.

xiii. Test for galvanization of metal (ferrous) parts as perm IS-2633/1973.

Besides, mechanical endurance test will have to be conduct on one set in the presence of our authorized person who shall be deputed to carryout acceptance tests before delivery of the

materials.

1.6.2 **Routine Tests**: - The following routine tests shall have to be conducted on each sets and results are to be furnished for consideration of deputing inspecting officer for inspection and conducting testing of the materials.

1. Power frequency voltage dry test
2. Measurement of resistance of main circuit
3. Tests to prove satisfactory operation.
4. Dimension check
5. Galvanization test.

1.7 GUARANTEED TECHNICAL PARTICULARS:-

The Bidder shall furnish the guaranteed technical particulars duly filled in the format at

Appendix-I along with the tender.

1.8 COMPLETENESS OF EQUIPMENT:-

Any fittings, accessories for apparatus which may not have been specifically mentioned in this specification but which are usual or necessary in equipment of similar plant shall be deemed to be included in the specification and shall be supplied by the Tender without extra charge. All plant and equipment shall be completed in all details whether such details are mentioned in the specification or not.

1.9 INSPECTION:-Routine and acceptance tests shall be conducted at the place of manufacturer. The bidder are requested to furnish details of equipment which will be used for testing along with tender. The bidder of those manufacturers who do not have adequate testing facilities for conducting routine and acceptance test are liable for cancellation. The successful bidder has to furnish routine test certificate and guaranteed certificate for approval prior to offer of materials for inspection for each consignment of offer.

GUARANTEED TECHNICAL PARTICULARS FOR 33KV, 400A, 50 HZ,

3 POLE, SINGLE BREAK TYPE

Sl. No	Particulars	Desired values	Bidder's offer
1	2	3	4
1.	Maker's name and country of origin	To be specified by the tenderer	
2.	Type of Switch	Rotating type only	
3.	Suitable for mounting	Horizontal only	
4.	Number of supporting post insulators per phase	4 nos.22 KV / 24 KV Post Insulators per phase as per ISS-2544/1973.	
5.	No. of Breakers per phase	Single Break	
6.	Post Insulator.		
a)	Maker's name and country of origin	Techno Ceramics / Allied Ceramic/JSI/Equivalent type test certificate to be provided along with bid.	
b)	Type of cementing	To be quoted for original cemented only & as per IS-2544-1973 & relevant IEC.	
c)	One minute power frequency withstand voltage Dry	95 KV RMS.	
d)	One minute power frequency withstand voltage Wet	75 KV RMS.	
e)	Visible discharge voltage	27 KV RMS.	
f)	Dry Flashover Voltage	To be specified by the tenderer	
g)	Power frequency puncture with stand voltage	1.3 times of actual dry flash over voltage	
h)	Impulse withstand voltage (switch in position)	170 KV (peak)	

i)	Creepage distance (mm)	380 mm minimum. (actual creepage distance for which type test have been conducted is to be specified by the tenderer	
7.	Impulse withstand voltage for positive and negative polarity 1.2 / 50 mircro-second wave		
a)	Across the isolating distance	195 KV (peak)	
b)	To earth & between poles	170 KV (peak)	
8.	One minute power frequency withstand voltage		
a)	Across the isolating distance	80 KV (RMS)	
b)	To earth & between poles	70 KV (RMS)	
9.a)	Rated normal current and rated frequency	400 amps. 50 Hz	
b)	Rated short time current.	16 KA (RMS)	
10.	Rated short circuit making capacity	25 KA (RMS)	
11.	Rated peak withstand current	40 KA (Peak)	
12.	Rated cable charging breaking capacity	40 KA (RMS)	
13.	Rated Transformer off load breaking capacity	16 Amp (RMS)	
14.	Rated line charging breaking capacity	5.3 Amps (RMS)	
15.	Minimum clearance between adjacent phases		
a)	Switch Closed (centre to centre)	1200 mm	
b)	Switch Opened (centre to edge of blade)	640 mm	
16.	Temperature rise		

	Temperature rise shall not exceed the maximum limit as specified below at an ambient temperature not exceeding in 40^0 C		
b)	Copper contacts in air	65^0 C	
c)	Terminal of switch intended to be connected to external conductor by bolts	50^0 C	
17.	Vertical Clearance from top of insulator cap to mounting channel	508 mm (minimum)	
18.	Type of Contact: -	a) Self aligned, high pressure jaw type fixed contacts of electrolytic copper of size 80 mm x 50 mm x 8 mm duly silver plated. Each contact should be revetted with three nos. Copper rivets with a bunch (minimum 3 mm thick) consisting of copper foils, each may vary from 0.15 mm to 0.25 mm. These total thickness of copper foils per jaw should be 6 mm. Jaw assemblies are to be bolted through stainless steel bolts and nuts with stainless steel flat and spring washer.	
		b) Solid rectangular blade type moving contact of electrolytic copper size 250 mm x 50 mm x 8 mm duly silver plated ensuring a minimum deposit of 10 micron of silver on copper contacts or as may be prescribed under relevant ISS / IEC.	
		c) Pressure spring to be used in jaw contacts shall be Stainless Steel having 8 nos of turn x 28 mm height x 14.4 mm diameter with 14 SWG wire (minimum six nos springs shall be used)	

19.	Connectors:-	Terminal connectors for both movable and fixed should be of copper flats of same size similar to that of moving contact blades (minimum 95% copper composition). The fixed connector shall of size 80 mm x 50 x 8 mm and the size of movable connector shall be size 80 x 50 x 8 mm with machine finishing duly silver plated with 2 nos. of 3/8‖ stainless steel bolts, nuts, plain washers & spring washers should be provided along with 2 nos solder less bimetallic sockets for each connector suitable sockets for each connector suitable up to 232 mm² AAA conductor.				
20.	Moving Contacts supports:-	Movable contact is to be supported by galvanized angle of 50 x 50 x 5 mm in each phase and the moving contact are to be bolted through 2 no stainless steel bolts and nuts with suitable stainless steel flat and spring washers.				
21.	Galvanization	a) Iron parts shall be dip galvanized as per IS-2633/1972.				
		b) b) The pipe shall be galvanized as per IS-4736/1968.				
22.	Details of Phase					
a)	Coupling Rod	25 mm nominal bore G.I. pipe medium gauge.				
b)	Operating Rod	32 mm nominal bore G.I. pipe medium gauge single length 6 mtrs. The detailed dimension of the G. I. pipe as per IS-1239 (Pt. I) as mentioned below :-				
		Nominal base (mm)	Outside diameter		Diameter thickness (mm)	
			Max	Min		
		25	34.2	33.3	3.25	
		32	42.9	42	3.25	
c)	Arcing Horns	10 mm dia G.I. rod with spring assisted operation.				

d)	Force of Fixed contact spring	To be specified by the tenderer.	
e)	Copper braided flexible tapes:-	450 mm length of flexible electrolytic copper tape or braided chord (with tin coated) having minimum weight 450 gms per meter and both ends shall be crimped with copper sockets through brass bolts and nuts with brass flat washers. Two nos of suitable copper sockets shall be used at both ends. The minimum no. of flexible wires should be 1536 of 36 SWG for each flexible chord.	
f)	Quick break device	Lever mechanism.	
g)	Bearings	4 nos. self lubricated bearing to be provided with grease nipple including 4th bearing being a thrust bearing.	
h)	Locking arrangement	Pad Lock & Key arrangement at both ‗ON' & ‗OFF' position.	
i)	Earth Terminal:	To be provided at base channels.	
23.	Supporting Channels	100 mm x 50 mm M.S. Channel hot dip galvanized.	
24.	Weight of each pole complete	To be specified by the tender	
25.	Detailed drawing	To be submitted by the bidder	

NB- Every AB Switch should bear the marking of manufacturer's name ,Purchaser's name , P.O. No., Sl. No. etc.

Name & Signature of Bidder with seal

GUARANTED TECHNICAL PERTICULARS OF 11KV 400AMP 3 POLE AB SWITCH

Slno.	Perticulars	Requirement	Bidder's Offer
1	**2**	**3**	**4**
1	Maker's name & Address	To be specified by the bidder	
2	Type of Switch	Rotating Type	
3	Suitable for mounting	Horizontal only	
4	No. of Breakers per phase	Single Break	
5	No. of Post Insulators per phase	2nos. of 12KV Post Insulators as per IS:2544/73 per phase	
6 (a)	Post Insulators Maker's Name & Country of Manufacture of Post Insulator	Techno Ceramic / Allied Ceramic /JSI/ equivalent Type Test certificates to be provided along with the offer.	
(b)	Type of cementing	Original Cementing. The insulator to be cemented with MCI (Hot dip galvanised /Al Alloy cap and MCI/Forged steel hot deep galvanized pedestral)	
(c)	Power frequency withstand voltage (Dry)	65KV RMS	
(d)	One minute Power frequencywithstand voltage (wet)	40KV RMS	
(e)	Visible discharge voltage	9KV RMS	
(f)	Dry flash over voltage	70 KV	

(g)	Power frequency puncture withstand voltage	110KV	
(h)	Creapage distance	320 mm	
(7)	Impulse withstand voltage for positive & negative polarity (1.2/50 micro second wave)		
(a)	Across the isolating distance	85KV Peak	
(b)	To earth & between poles	75KV Peak	
8	Rated one minute Powerfrequency withstand voltage		
(a)	Across the Isolating distance	32KV(RMS)	
(b)	To earth & between poles	28KV(RMS)	
9(a)	Rated voltage nominal/maximum	11/12KV	
(b)	Rated normal current and rated frequency	400 Amps. 50hz	
10	Rated short-circuit making capacity	20KA (Peak)	
11	Rated Short-time current	16KA	
12	Rated peak withstand current	40KA	
13	Rated mainly active load breaking capacity	10KA	
14	Rated transformer off load breaking capacity	16.3A	

15	Rated line charging capacity	2.5A(RMS)	
16	Rated cable charging capacity	10A(RMS)	
17	Minimum clearance betweenadjacent phase		
(a)	Switch closed (center to center)	Mm	
(b)	Switch opened (Center of post insulator to the edge of the blade)	Mm	
18	Temperature rise The Temperature rise should not exceed the maximum limit to $65^{O}C$ at an ambient temperature not exceeding $40^{O}C$.	The Temperature rise of contacts & terminals are within permissible limit of $65^{0}C$ & $50^{o}C$ respectively.	
19	Vertical clearance from top of insulator cap to mounting channel.	254 mm	
20	Type of connect	a) Self aligned, high pressure jaw type fixed contacts of electrolytic copper of size 80 mm x 50 mm x 8 mm duly silver plated. Each contact should be revetted with three nos. Copper rivets with a bunch (minimum 3 mm thick) consisting of copper foils, each may vary from 0.15 mm to 0.25 mm. These total thickness of copper foils per jaw should be 6 mm. Jaw assemblies are to be bolted through stainless steel bolts and nuts with stainless steel flat and spring washer. b) Solid rectangular blade type moving contact of electrolytic copper size 250 mm x50 mm x 8 mm duly silver plated ensuring a minimum deposit of 10 micron of silver on copper contacts or as may be prescribed under relevant ISS / IEC.	

<table>
<tr><td></td><td></td><td colspan="4">c) Stainless Steel 4 NOS of Pressure springs are to be used in each jaw contacts having 8nos. of turns X28mm heights X14.4mm diameter with 14 SWG wire</td><td></td></tr>
<tr><td>21.</td><td>Terminal connectors:</td><td colspan="4">Terminal connectors for both movable and fixed should be of copper flats of same size similar to that of moving contact blades (minimum 95% copper composition). The fixed connector shall of size 80 mm x 50 x 8 mm and the size of movable connector shall be size 80 x 50 x 8 mm with machine finishing duly silver plated with 2 nos. of 3/8‖ stainless steel bolts, nuts, plain washers & spring washers should be provided along with 2 nos solder less bimetallic sockets for each connector suitable sockets for each connector suitable up to 100 mm² AAA conductor.</td><td></td></tr>
<tr><td>22</td><td>Terminal support</td><td colspan="4">Movable terminal contact is supported by G.I. angle of size 50 X 50x5mm on each phase and the moving contact are to be bolted through 2 no stainless steel bolts and nuts with suitable stainless steel flat and spring washers.</td><td></td></tr>
<tr><td>23.</td><td>Galvanization</td><td colspan="4">a) Iron parts shall be dip galvanized as per IS-2633/1972.</td><td></td></tr>
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</table>

		25	34.2	33.3	3.25	
		32	42.9	42	3.25	
(c)	Arcing Horn	10 mm dia G.I. rod with spring assisted operation				
(d)	Force of fixed contact spring	30 lbs to 50 lbs				
(e)	Copper braided flexible taps	320mm long 2no. tin coated copper braided flexible tape both end seated with cupper sheets duly punched for fixing				
(f)	Quick break device	Lever mechanism				
g)	Bearings	4 nos. self lubricated bearing to be provided with grease nipple including 4th bearing being a thrust bearing.				
h)	Locking arrangement	Pad Lock & Key arrangement at both ‗ON' & ‗OFF' position.				
i)	Earth Terminal:	To be provided at base channels.				
25.	Supporting Channels	75 x 40 x 5mm hot dip galvanized Chanel.				
26.	Weight of each pole complete	To be specified by the tender				
27	Detailed Drawing	To be provided by the bidder				

NB- Every AB Switch should bear the marking of manufacturer's name ,Purchaser's name , P.O. No., Sl. No. etc.

Name & Signature of Bidder with seal