

Technical Specification of 11KV 200Amp. (3-Pole/2-Pole) Air Break Switch

1. Scope:-

This specification covers manufacturing, testing and supply of 11KV 200Amp. 50Hz Air Break switches for outdoor installation in horizontal configuration. The switches are suitable for operation under off-load conditions only and are intended for use on Distribution Sub-stations and tapping sectionalizing points of 11 KV lines.

2. Description of the materials:-

The 11KV A.B. Switch sets shall conform to the following parameters: -

- | | |
|--------------------------------------|--------------------------|
| a) Number of poles | 2/ 3 |
| b) Number of Post insulator per pole | 2nos. 12KVpostinsulator. |
| c) Nominal system voltage | 11KV |
| d) Highest system voltage | 12KV |
| e) Rated frequency | 50Hz |
| f) System earthing | Effectively earthed. |
| g) Rated nominal current | 200 amps |
| h) Altitude of installation | Not exceeding 1000M |

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

- | | |
|--|-------------|
| a) Power frequency withstand voltage (dry) | 25KV (RMS) |
| b) Power frequency withstand voltage(wet) | 35KV (RMS). |
| c) Implies withstand voltage(dry) | 75KV |
| d) Power frequency puncture withstand | 1.3 |

3. Standards: -

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

- a) IS-9920 (Part-I to V)
- b) IS-2544/1973 (for porcelain post insulators)
- c) IS-2633, (for galvanization of ferrous parts.) or its latest amendments if any.

4. Insulator make: -

12KV post insulators complete with post and 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 and scrutiny.

The bidder shall mention make, type of insulation materials, metal fittings, Creepage distance, protected Creepage distance, tensile Strength, compressing strength, torsion strength and cantilever strength.

5. Climatic condition: -

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

- | | |
|--|-----------|
| a) Maximum ambient air temperature | 45 ° C |
| b) Maximum daily average air temperature | 35 ° C |
| c) Maximum yearly average ambient air temperature | 30 ° C |
| Maximum temperature attainably by a body exposed to the Sun. | 50 ° C |
| d) Sum. | |
| f) Minimum ambient air temperature | 0 ° C |
| g) Maximum relative humidity | 100% |
| h) Minimum number of rainy days per annum | 70 |
| i) Average number of rainy days per annum | 120 |
| j) Average annual rain fall | 150cm. |
| k) Number of months of tropical monsoon conditions | 4 |
| m) Degree of exposure to atmospheric pollution | normally |
| n) Atmosphere. | Polluted. |

6. Other technical details: -

- 6.1 General: - The 11KV A.B. Switch Set shall be the gang operated rotating single air break type having 2 post insulators 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 staining that might adversely affect any of its parts. The required base M.S. Channel (hot dip galvanized) phase coupling rod, operation rod with intermediate guide braided with flexible electrolytic copper, tail piece of required current carrying capacity and operation mechanism with "ON" & "OFF" positions shall be provided. The operation rod shall be medium gage of 32mm diameter nominal bore G.I. pipe single length 6 meters. The phase coupling rod for gang operation shall be of medium gauge 25 mm dia. nominal bore G.I pipe . The Rating post insulators shall be provide with suitable bearing mounted on a base channel with 8mm dia 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 stainless steel bolts with double nuts. All the bearings shall be provided with grease nipple. All metal (ferrous) parts shall be galvanized an polished. The pipe shall be galvanized in accordance with IS-4736/1968.The post insulators should be fixed with the base channel using Galvanized Nuts and Bolts.
- 6.2. Mounting:- The A.B. Switches shall be suitable for horizontal mounting in double pole sub-station structures. MS Galvanized base Channel & base support channel should be of min. size 75x40x6 mm.
- 6.3. Switching Blades:- It shall be made out of electrolytic copper with silver plated. The approximate size shall be 220mm X 50X 6 mm. 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.
- 6.4. Fixed Contracts:- The fixed Jaw type female contracts shall be made of electrolytic copper (minimum 95% copper composition) duly silver coated controlled by stainless steel 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 move contract blade without the same being transmitted to the post insulator. The arrangement made in this regard shall be specifically shown in the drawing.
- 6.5 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 10mm dia. G.I. Rod with spring assisted operation.
- 6.6. Terminal Connectors:- Terminal connectors shall be robust in design. The size of fixed connector shall be (80 X 50 X 6 mm) and size of movable connector shall be of (80 X 50) X (80 X 50) X 6 mm of copper casting with uniform machine finishing duly silver plated made out of minimum 95% copper composition with 2 nos. 12mm dia holes provided with suitable brass bolts and double nuts, flat washers & 2nos. bimetallic solder less sockets suitable upto 80 mm² conductor.
- 6.7. Spacing:- The minimum clearance between phases to the switch shall be 760mm. The operation down rod shall be at a transverse distance of 300mm from the outer limb of the switch. The centre spacing between two post insulators of the same phase shall be 380mm. In the open position of the A.B. switches the moving blade shall rotate through 90°. This shall be exhibited in the drawing.
- 6.8. Sample, Drawing & Literatures: - Sample of each items 11KV 200 amps. A.B. Switch shall be furnished and three copies of drawings item similar to the sample shall be furnished along with the tender.
- 6.9. The details of construction and materials of different parts of the A.B. Switch shall clearly be indicate in the tender and illustrative pamphlet / literature for the same shall be submitted along with the tender.

7. TEST & TEST CERTIFICATE: -

- 7.1 Type Test: - Certificate for the following type tests conducted (within five years proceeding to the

date of opening of the tender) on a prototype set of A.B. Switch in a NABL approved test house/CPRI shall have to be submitted along with offer.

Dielectric Test (impulse and one minute power frequency withstand voltage test.)

- i. Temperature rise test (for contracts and terminals)
- ii. Short Time current and peak withstand current test.
- iii. Mainly active load breaking capacity test.
- iv. Transformer off-load breaking capacity test.
- v. Line charging breaking capacity test.
- vi. Cable charging breaking test.
- vii. Operation and mechanical endurance test.
- viii. Mechanical strength test for post insulator, as per IS-2444/1937 shall be furnished.
- ix. Test for galvanization of metal (ferrous) parts.

8. Routine /Acceptance Test: -

The inspection may be carried out by the Purchaser at any stage of manufacture. The successful bidder shall grant free access to the Purchaser's representative at a reasonable time when the work is in progress. The following routine tests shall have to be conducted on each set and results are to be furnished for consideration of deputed inspecting officer for inspection and conduction testing of the materials at the works of the manufacturer. The supplier shall give fifteen days advance intimation to the Purchaser to enable him to depute his representative for witnessing the tests.

- a. Power frequency voltage dry test.
- b. Measurement of resistance of main circuit.
- c. Tests to prove satisfactory operation.
- d. Dimension Check
- e. Galvanization test.
- f. Operational test.

9. Guaranteed Technical Particulars: -

The bidder shall furnish the guaranteed technical particular duly filled in the format along with the tender.

10. Completeness of Equipment: -

All fittings, accessories of 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.

Guaranteed Technical Particulars of 11 KV 200 Amp. (3-Pole/2-Pole) A.B. Switch

Sl. No.	Particulars	Requirement	Bidder's Offer	
			3-Pole AB Switch	2-Pole AB Switch
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 Post insulators per phase	2nos. of 12KV Post insulators as per IS: 2544/73 per phase		
5.	Post Insulators:			
(a)	Maker's Name & Address of Post Insulator manufacturer	Reputed make. (All the post insulators provided shall be of same make)		
(b)	Type of cementing	Original cementing only		

(c)	Power frequency withstand voltage (Dry)	35KVrms		
(d)	One minute Power frequency withstand voltage (Wet)	35KVrms		
(e)	Visible discharge voltage	9KVrms		
(f)	Dry flash over voltage	85KV		
(g)	Power frequency puncture withstand voltage	1.3 times of actual dry flash over voltage.		
(h)	Creepage distance	230mm, However the actual creepage distance for which type test has been conducted is to be supplied		
6.	Impulse withstand voltage for +ve & -ve polarity (1.2/50micro second wave)			
(a)	Across the isolating distance	85KVpeak		
(b)	To earth & between poles	75KVpeak		
7.	Rated one minute Power frequency withstand voltage			
(a)	Across the Isolating distance	32KV(RMS)		
(b)	To earth & between poles	28KV(RMS)		
8(a)	Rated voltage nominal/maximum	11KV /12KV		
(b)	Rated normal current and rated frequency	200 Amps., 50Hz		
9.	Rated short-circuit making capacity	25KA (peak)		
10.	Rated Short-time current	20KA(rms)		
11.	Rated peak withstand current	50KA(peak)		
12.	Minimum clearance between adjacent phase			
(a)	Switch closed (center to center)	760 mm		
(b)	Switch opened (Center of post insulator to the edge of the blade)	380 mm		
13.	<u>Temperature rise:</u> The Temperature rise should not exceed the maximum limit as specified at an temperature not exceeding 40°C	65°C		
	Copper contacts silver faced terminal of switch intended to be conducted to external conductor by bolts or screws at an ambient temperature should not exceed	50°C		
14.	Vertical clearance from top of insulator cap to mounting channel	254mm		
15.	Type of Connect	(a) Self aligned high pressure jaw type fixed contacts of electrolytic copper of size		

		70x35x6mm duly silver plated. Each contact should be riveted with 3nos. copper rivets with a bunch of copper strips/ foil suitable to give desired spring action jaw assemblies are to be bolted through brass bolt and nuts with washer		
		(b) Solid rectangular blade type moving contact of size 35X6 mm and length 220 mm duly silver plated		
		(c) Pressure springs are to be used in each jaw contacts should be phosphorous bronze having 8nos. of turns X 28mm heights X 14.4mm diameter with 14 SWG wire.		
16.	Terminal Connector	Terminal connector for both movable and fixed should be of copper casting (minimum 95 % copper composition). The fixed connector shall be of size (65x35x6)mm and the size of the movable connector(65x35)x(65x35)x6 mm with machine finishing duly silver plated with 2 nos. 12 mm dia. Hole with suitable brass bolts and double nuts with brass flat washer and 2 nos. Solder less bimetallic sockets per each connector suitable to 55 mm ² conductor.		
17.	Moving contact supporting angle	Movable contact is to be supported by G.I Angle of size 45x45x5 mm on each phase and the moving contact are to be bolted through 2 nos. stainless flat and spring washers suitably.		
18.	Galvanization	(a) Iron parts are hot dip Galvanized as per IS:2633/ 1972 (Latest Amendment)		
		(b) The pipe is galvanized as per IS:4736/1968 (Latest Amendent)		
19.	Details of Phase:			
(a)	Coupling Rod	25mm nominal bore G.I. Pipe medium gauge.		
(b)	Operating Rod	32mm nominal bore G.I. Pipe medium gauge single length 6meters.		
	Nominal Outside dia. (in mm)	25mm	32mm	
	Max.	34.2	42.9	

	Min. Wall thickness	33.3 3.25	42 3.25		
(c)	Arcing Horn	8mm dia G.I. Rod with springy action			
(d)	Bearing System	One bearing shall be provided near the base channel to assist in operation			
(e)	Force of fixed contact spring	50 to 75lb			
(f)	Bearings	3nos. self lubricating is provided with grease nipple and axial thrust bearing arrangement.			
(g)	Locking Arrangement	Pad lock and key arrangement at both "ON & OFF" position.			
(h)	Earth terminal	Provided at base channel at opposite ends.			
(i)	Copper braided flexible tapes	320mm long 2no. tin coated copper braided flexible tape both end seated with copper sheets duly punched for fixing			
(j)	Quick break device	Lever mechanism			
(k)	"T" Connector	The "T" connector provided on the channel having "Moving Contact" shall be of G.I. nut & bolts at the bottom end to facilitate replacement of this unit only during requirement and avoid entire change of the arm.			
(l)	I-Bolt	The "I-bolt" shall be longer with 75mm thread.			
20.	Supporting Channel	75mm x 40mm M.S. Channel (Hot dip galvanized)			
21.	Weight of each pole	20Kg. (Approximately)			
22.	Detailed drawing submitted?	To be provided by bidders			
N.B.	(i) Ferrous part shall duly galvanized as per IS:2629/1985 (1 st Revision), (Amendment-2) and non-ferrous parts shall be silver plated.				
	(ii) The G.I. pipes and rods shall be galvanized as per IS:4736/1968 (1 st Revision), (Amendment-1) for hot-dipped zinc coating on M.S. tube.				
	(iii) Certificate from a Government approved laboratory regarding composition of copper in electrolytic copper casting of materials should be submitted during inspection of materials at the cost of tenderer.				
	(iv) Items not covered in the G.T.P., but relevant in design, manufacturing, quality control & testing of materials shall be governed by the relevant IS with latest amendment.				

Technical Specification of 33KV 400Amp. (3-Pole) Air Break Switch

1. **SCOPE:-**

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

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

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

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

Sl. No.	Description	Parameters P.I. of 33KV AB Switches
i)	Power frequency withstand voltage	95KV
ii)	Power frequency withstand voltage (Wet) KV(rms)	75KV(rms)
iii)	Impulse withstand voltage (dry) KV	170KV(peak)
iv)	Power frequency puncture withstand voltage	1.3 times the actual dry flashover voltage.

3. **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.

4. **INSULATORS:-**

22 KV/24 KV class 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.

5. **CLIMATIC CONDITIONS:-**

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

1. Maximum daily average air temperature 35⁰C
2. Maximum yearly average ambient air temperature 30⁰C
3. Maximum temperature attainable by body exposed to the sun 50⁰C
4. Minimum ambient air temperature 0⁰C

5. Maximum relative humidity	100%
6. Minimum number of rainy days per annum	70
7. Average number of rainy days per annum	120
8. Average annual rain fall.	150 cm.
9. Number of months of tropical monsoon conditions	4
10. Maximum wind pressure.	260 Kg./ mm ²
11. Degree of exposure to atmospheric pollution.	Normally polluted atmosphere.

6. **TECHNICAL DETAILS:-**

6.1 The 33 KV A.B. Switch Set shall be gang operated (with double tandem pipe) single air break outdoor type horizontal mounting having 4nos. 22/24 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.

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

6.3 Switching Blades:- It shall be made out of electrolytic copper with silver plated. The approximate size shall be 220mm x 50mm x 8mm. 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

6.4 Fixed Contracts:- The fixed jaw type female contracts (50x8x80)mm 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.

6.5 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 10mm dia. G.I. Rod with spring assisted operation.

6.6 Terminal Connectors:- Terminal connectors shall be robust in design. The size of fixed connector shall be (80 x 50 x 8 mm) and size of movable connector shall be of (80 x 50) 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. 12mm 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

mm² conductor.

6.7 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 640 mm. In the open position of the A.B. Switches the moving blade shall rotate through an angle of 90⁰. This shall be exhibited in the drawing.

6.8 Drawing & Literatures:- Drawings of 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.

7. TESTS & TEST CERTIFICATE

7.1 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.

7.2 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.

- i. Power frequency voltage dry test
- ii. Measurement of resistance of main circuit
- iii. Tests to prove satisfactory operation.
- iv. Dimension check
- v. Galvanization test.

8. GUARANTEED TECHNICAL PARTICULARS:-

The Bidder shall furnish the guaranteed technical particulars duly filled in the format at Appendix-I along with the tender.

9. 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.

- 10. INSPECTION:-**Routine and acceptance tests shall be conducted at the place of manufacturer. The bidders 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 of 33KV 400 Amp. (3-Pole) A.B. Switch

(To be submitted with offer)

Sl. No.	Particulars	Requirement	Bidder's Offer
1.	Maker's Name & Address	To be specified by the bidder	
2.	Type of Switch	Horizontal Rotating type only	
3.	Number of supporting post insulator per phase	4nos. of 22/24Kv Post insulator per phase as per ISS-2544/1973	
4.	Post Insulator		
(a)	Maker's name & address		
(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	95KVrms	
(d)	One minute power frequency withstand voltage (wet)	75KV(rms)	
(e)	Visible discharge voltage	27KV(rms)	
(f)	Dry Flashover voltage	To be specified by the bidder	
(g)	Power frequency puncture withstand voltage	1.3 times of actual dry flash over voltage	
(h)	Impulse withstand voltage	170 KV (peak)	
(i)	Creepage distance (mm)	380mm minimum (actual creepage distance for which type test have been conducted is to be specified by the bidder)	
5.	Impulse withstand voltage for positive and negative polarity 1.2 / 50 micro- second wave		
(a)	Across the isolating distance	195 KV (peak)	
(b)	To earth & between poles	170KV	
6.	One minute power frequency withstand		
(a)	Across the isolating distance	80KV	
(b)	To earth & between poles	70KV	
7.	Rated normal current and rated frequency	400 amps. 50 Hz	
8.	Rated short time current.	16 KA (rms)	

9.	Rated short circuit making capacity	25 KA (rms)	
10.	Rated peak withstand current	40 KA (peak)	
11.	Rated cable charging breaking capacity	40 KA (rms)	
12.	Rated Transformer off load breaking capacity	16 Amp (rms)	
13.	Rated line charging breaking capacity	5.3 Amps (rms)	
14.	Minimum clearance between adjacent phases		
(a)	Switch close (centre to centre)	1200mm	
(b)	Switch opened (centre to edge of blade)	640mm	
15.(a)	<u>Temperature rise</u> 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	50 ⁰ C	
16.	Vertical Clearance from top of insulator cap to mounting channel	508mm (minimum)	
17.	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 reverted 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. (total thickness of copper foils per jaw should be 6mm). Jaw assemblies are to be bolted through brass bolts and nuts with brass flat and spring washer.	
		b) Solid rectangular blade type moving contact of electrolytic copper size 220mmx50mmx8mm duly silver plated (ensuring a minimum deposit of 10micron of silver on copper contacts or as may be prescribed)	
		c) Pressure spring to be used in jaw contacts shall be Stainless Steel having 8nos. of turnx28mm height x14.4mm diameter with 14 SWG wire (minimum six nos springs shall be used)	
18.	Terminal Connector	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 80mmx50x8mm and the size of movable connector shall be size 80x50x8mm with machine finishing duly silver plated with 2nos. of 12mm brass bolts, nuts, 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 232mm ² AAAC.															
19.	Moving Contact	Movable contact is to be supported by galvanized angle of 50x50x5mm in each phase and the moving contacts are to be bolted through 2no. stainless steel bolts and nuts with suitable stainless steel flat and spring washers.															
20.	Galvanization	(a) Iron parts shall be dip galvanized as per IS:2629/1985 (1 st Revision), (Amendment-2)															
		(b) The pipe shall be galvanized as per IS-4736/1968 (1 st Revision), (Amendment-1) for Hot-dipped Zinc coating on M.S. tubes.															
21.	Details of Phase																
(a)	Coupling Rod	25mm nominal bore G.I. pipe medium gauge.															
(b)	Operating Rod	32 mm nominal bore G.I. Pipe medium gauge single length 6mtrs. The detailed dimension of the G. I. pipe as per IS-1239 (Pt.-I) as mentioned below :- <table border="1" style="margin-left: 20px;"> <thead> <tr> <th rowspan="2">Nominal Base</th> <th colspan="2">Outside Diameter</th> <th rowspan="2">Wall Thickness</th> </tr> <tr> <th>Max.</th> <th>Min</th> </tr> </thead> <tbody> <tr> <td>25mm</td> <td>34.2mm</td> <td>33.3mm</td> <td>3.25mm</td> </tr> <tr> <td>32mm</td> <td>42.9mm</td> <td>42mm</td> <td>3.25mm</td> </tr> </tbody> </table>	Nominal Base	Outside Diameter		Wall Thickness	Max.	Min	25mm	34.2mm	33.3mm	3.25mm	32mm	42.9mm	42mm	3.25mm	
Nominal Base	Outside Diameter			Wall Thickness													
	Max.	Min															
25mm	34.2mm	33.3mm	3.25mm														
32mm	42.9mm	42mm	3.25mm														
(c)	Arcing Horn	8mm dia G.I. rod with spring assisted operation.															
(d)	Force of Fixed contact spring	To be specified by the bidder															
(e)	Copper braided flexible tapes	320mm 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 channel	
(j)	'T' connection	The 'T' connection provided on the channel having 'Moving Contact' shall be G.I. nut & bolts at the bottom end to facilitate replacement of this unit only during requirement & avoid entire change on the arm	
(k)	'I'-Bolt	The 'I'-Bolt shall be longer with 75mm thread.	
22	Supporting Channels	100mmx50mm M.S. Channel hot dip galvanized.	
23	Weight of each pole complete	To be specified by the bidder	

Technical Specification of 11KV 200Amp. (3-Pole/2-Pole) Horn Gape Fuse

1. **SCOPE:-** This specification covers the manufacture, testing and supply of 11 KV 200 Amps 2-pole H.G. Fuse set and 11KV 200Amps 3-pole H.G. Fuse sets.

2. **Description of Materials:-** The 11 KV H.G. Fuses shall be suitable for out door operation in horizontal configuration under the climatic conditions specified. It shall be of the following ratings:-
 1. Number of Poles 2/3
 2. No. of insulator per Pole 2nos. 12KV Polst Insulator
 3. Nominal system voltage 11KV
 4. Highest system voltage 12KV
 5. Rated frequency 50Hz
 6. System frequency Effectively earthed
 7. Rated normal current 200 Amps.
 8. Altitudes of installation Not exceeding 1000M

The post insulator used in the H.G. Fuse set shall have the following ratings :-

1. Power frequency withstand voltage (dry) 33KV(rms)
2. Power frequency withstand voltage (wet) 35KV(rms)
3. Impulse withstand voltage(dry) 75KV(peak)
4. Power frequency withstand voltage 1.3 times the actual dry flashover voltage of the unit

3. **STANDARDS:-**

The H.G. Fuse set shall conform to the following standards.

- IS- 9385-1980 (for high voltage expulsion fuses and similar fuses).
- IS- 2544-1973 (for porcelain post insulators or its latest amendments if any.).
- IS-2633-1979 (for Galvanization of ferrous parts).

4. **INSULATOR MAKE:-** 12 KV post insulator complete with pedestal cap duly cemented to be used in 11 KV H.G. Fuse sets confirming to IS-2544/1973.

5. **TECHNICAL DETAILS:-** The H.G. Fuses shall have adjustable arcing horns made of solid copper rod having 7.62 mm dia. The horns shall be fitted with screwing devices with fly nuts for fixing and tightening the fuse wire. It shall have robust terminal connectors of size 80 mm x 50 mm x 6 mm made of copper casting (95 % minimum copper composition) duly silver plated with two numbers of 12mm dia. Brass bolts and double nuts with flat brass washers. The connectors should be capable of connecting crimpable conductor upto 80mm² size (ACSR/Alloy) with bimetallic solderless socket. The H.G Fuse set shall be suitable for horizontal adjacent mounting on sub-station structures. The minimum clearance between the phases of the fuse set shall be 760mm and the centre to centre (distance between two post insulators of the same phase) shall be 410 mm. All metal (ferrous) parts shall be galvanized and polished. Only 12 KV post insulator (original cemented and not pin insulators shall be used for the H.G. Fuse Set.

6. **CLIMATIC CONDITIONS:-** The H.G. fuse set shall be suitable for operation under the following climatic conditions:-
 1. Maximum ambient air temperature 45⁰C
 2. Maximum daily average air temperature 35⁰C
 3. Maximum yearly average ambient air temperature 30⁰C
 4. Maximum temperature attainable by a body exposed to the sun. 50⁰C
 5. Minimum ambient air temperature 0⁰C
 6. Maximum relative humidity 100%

7. Average number of thunderstorm days per annum	70days
8. Average number of rainy days per annum	120days
9. Average annual rain fall	150cm
10. Number of months of tropical monsoon conditions	4
11. Maximum wind pressure	Kg/mm
12. Degree of exposure to atmospheric pollution	Normally polluted atmosphere

7. Type Test:-

Certificate for the following type tests conducted on a prototype set of HG Fuse in a NABL approved test house/CPRI shall have to be submitted along with offer.

1. Dielectric test (impulse & one minute wet power frequency withstand voltage test.)
2. Temperature rise test (for terminals)
3. Mechanical strength test for the post of insulator as per IS-2544/1973
4. Test for galvanization of metal (ferrous) parts.

8. ROUTINE/ACCEPTANCE TESTS:-

The inspection may be carried out by the Purchaser at any stage of manufacture. The successful bidder shall grant free access to the Purchaser' s representative at a reasonable time when the work is in progress. The following routine tests shall have to be conducted on each set and results are to be furnished for consideration of deputing inspecting officer for inspection and conduction testing of the materials at the works of the manufacturer. The supplier shall give fifteen days advance representative intimation to the Purchaser to enable him to depute his for witnessing the tests.

- i) Power frequency voltage dry test
- ii) Dimension Check
- iii) Galvanization test.

9. Guaranteed Technical Particulars:-

The bidders are required to furnish the guaranteed technical particulars duly filed in the proforma along with the bid.

10. Completeness of Equipment :

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

11. Inspection:-

Routine and acceptance test shall be conducted at the place of manufacturer. The bidders are requested to furnish details of equipments which will be used for testing along with the bid. The bids of these 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 guarantee certificate for each consignment of materials to be inspected at the time of offer of materials for inspection.

Guaranteed Technical Particulars of 11 KV 200 Amp H.G. Fuse (3-Pole/ 2-Pole)

Sl. No.	Particulars	Requirement	Bidder's Offer	
			3-Pole H.G. Fuse	2-Pole H.G. Fuse
1.	Maker's Name & Address	To be specified by the bidder		
2.	Operating voltage	11KV		
3.	No. of Post insulators per phase	2nos. of 12KV Post insulators per phase		
4.	Rated normal current & normal frequency	200Amp., 50Hz		
5.	Vertical clearance from the top of insulator to mounting channel	254mm (minimum)		
6.	Height of the riser for carrying the horn	150mm from the cap top of insulator		
7.	Post Insulators:			
(a)	Maker's Name & Address of Post insulator manufacturer	Reputed make. All the post insulators provided shall be of same make		
(b)	Type of cementing	Original cementing only		
(c)	1 minute Power frequency withstand voltage (dry)	35KVrms		
(d)	1 minute Power frequency withstand voltage (wet)	35KVrms		
(e)	Visible discharge voltage	9KVrms		
(f)	Dry flash over voltage	85KV		
(g)	Power frequency puncture withstand voltage	1.3 times of actual dry flash over voltage.		
(h)	Creepage distance	270mm (minimum). Actual creepage distance for which type test has been conducted is to be supplied.		
8.	Impulse withstand voltage for +ve & -ve polarity (1.2/50 micro second wave)			
(a)	Across the isolating distance	85KV(peak)		
(b)	To earth & between poles	75KV(peak)		
9.	One minute Power frequency withstand voltage			
(a)	Across the isolating distance	32KV(rms)		
(b)	To earth & between poles	28KV(rms)		
10.	Details of Arcing Horn	1 SWG (7.62mm) copper rod silver plated provided with screwing arrangement on the fuse carrier made of copper casting for fixing fuse wire (Total length- 635mm). All the bolts, nuts & washers should be made out of brass.		
11.	Riser Unit (150mm height	(c) Raiser cum connector made out		

	total)	of copper casting (with minimum 95% copper composition having riser size (80mm x 30mm x 8mm) and connector of size (80mm x 50mm x 8mm) duly silver plated and machine finishing provided with 2nos. 12mm dia. brass bolts and double brass nuts with flat brass washers and 2nos. solder less bimetallic socket per each connector suitable up to 80mm ² conductor.		
		(d) 100mm height G.I. Riser made of 19mm nominal bore medium gauge G.I. pipe welded with 2nos. of G.I. flat of 30mm x 5mm of both ends fixed with 10mm dia. Stainless steel bolts and nuts with flat & stainless steel spring washer.		
12	Galvanization	(a) All ferrous parts shall be hot-dipped Galvanized as per IS:2629/1985 (latest amendment)		
		(b) The pipe shall be galvanized as per IS:4736/1968 (latest amendment)		
13	Supporting Channel	75mm x 40mm M.S. Channel (Hot dip Galvanized)		
14	Weight of each pole	16 Kg. (approx.)		
15	Detailed drawing submitted?	To be provided by bidder		
N.B	(i) Ferrous part shall be duly galvanized as per IS:2629/1985 (1 st Revision) , (Amendment-2) and non ferrous part shall be silver plated.			
	(ii) Certificate from Government approved laboratory regarding composition of copper in electrolytic copper casting of materials should be submitted during inspection of materials at the cost of tender.			

Name & Signature of Tenderer with seal