

## **TECHNICAL SPECIFICATION OF 33 KV LINE ISOLATORS**

### **1.0 SCOPE**

- 1.1 This specification covers design, manufacturing, assembly, testing before supply, inspection, insurance (transit & storage), packing, delivery and other basic requirements in respect of out door type 33 kV rating off load, double break centre rotating, isolators, 800 Amps, 25 KA/3 Seconds with hardware's, accessories and auxiliary equipment required for their satisfactory operation in various sub stations in western Uttar Pradesh under 'PVVNL-Meerut'.
- 1.2 The equipment offered shall be complete with all parts necessary for their effective and trouble free operation. Such parts shall be within the scope of supply irrespective of whether they are specifically indicated in the commercial order or not.
- 1.3 It is not the intent to specify, completely here in all the details of design and construction of the isolator. However, the isolator shall confirm, in all respects to high standard of engineering, design and workmanship as listed in annexure I). It shall be guaranteed in a manner acceptable to the purchaser who will interpret the meaning of drawings and specification and shall have power to reject any work or material, which, in his judgment, is not in accordance therewith.
- 1.4 The isolator offered shall be complete with all components necessary for its effective and trouble free operation. Such components shall be deemed to be within the scope of supplier's supply. Irrespective of whether those are specifically brought out in this specification and/or in the commercial order.

### **2.0 APPLICABLE STANDARD**

- 2.1 The isolator shall conform to the latest revisions, available at the time of placement of order of relevant standard, rules and codes listed in annexure-I.
- 2.2 Equipment meeting with the stipulations of equivalent IEC, ANSI, CSA, DIN standard, which ensure equal or better quality than the standards listed in annexure-I, shall also be acceptable. In such case the contractor should submit along with his offer, two copies of such standards in authentic English translation, if the language of the standard is other than English.

### **3.0 GENERAL TECHNICAL REQUIREMENTS**

#### **3.1 Type of Disconnects**

The isolators shall be three phase gang operated horizontal double break type with rotating type moving blades and with or without gang operated vertical break each phase.

### 3.2 Current Carrying Parts

Material of blades and contacts of earthing switch shall be the same as those of main switch moving blade and contacts respectively. Cross sectional area of earthing blades and contacts shall not be less than 50% of cross sectional area of main blades and contacts. Earthing blades shall have the same short time current rating (thermal & dynamic) as that of main switch.

### 3.3 Current Density

Current density to be adopted for all the parts of isolator and terminal connector shall not exceed the following limits:

- a. Hollow tube section –Copper- 2.0 A/sqmm
- b. Flat section – Copper 1.6 A/sqmm
- c. Terminal connectors –Alum. 1.0 A/sqmm

### 3.4 Insulators

- i) The insulator shall be provided with a completely galvanised steel base design for mounting on the support. The base and mounting arrangement of the insulator shall be such that the insulator shall be rigid and self supporting and no guying or cross bracing between phase shall be necessary.
- ii) Insulator shall be made of homogeneous and vitreous porcelain of high mechanical & dielectric strength. It shall have sufficient mechanical strength to sustain electrical and mechanical loading on account of wind load, short circuit stresses etc. Glazing of the porcelain shall be uniform brown or dark brown colour with a smooth surface arrange to shed away rain water. Porcelain and metal parts shall be assembled in such a way that any thermal differential expansion between the metal and porcelain through the range of temperature specified in this specification shall not loosen the parts or create undue internal stresses which may affect the mechanical or electrical strength or rigidity.
- iii) Cap of the insulator shall be of high grade malleable steel casting. It shall be machine faced and hot dip galvanised as per IS 3638, IS 2623. The cap shall have four number of tapped holes spaced on a pitch circle of diameter of 76 mm. To accommodate the terminal clamps of Busbar.
- iv) The insulator unit shall be assembled in a suitable jig to ensure correct positioning of the top and bottom metal fittings relative to one another.

### 3.5 Operating Mechanism

- i. Manual operating mechanism gang operated through hand-operated lever shall be provided for main switch.
- ii. The operative mechanism shall provide quick, simple and effective operation. The design shall be such that one person shall be able to operate the isolator without undue efforts. Isolator operating mechanism should be such that it should not operate by gravity, wind, short circuit, seismic acceleration, vibration, shock, accidental touching.

- iii. The line isolator should be fitted with manually gang operated line earthing switches. In bus isolators these earth switches are not to be provided.

### 3.6 Accessories

- i. Name plate (Complete details of the parameter)
- ii. Padlocking device

### 3.7 Earthing

- i. The frame of each disconnecter switch shall be provided with two reliable earthing terminals for connecting to earth mat. The connection shall be such that it can carry specified short circuit current.

### 3.8 Design and Construction

- i. Contractor shall have to give full details of design, manufacturing, quality control etc of the equipment offered in respect of the following items.
  - 1. Contacts material, current density etc.
  - 2. Contact support and fixing arrangement on insulator.
  - 3. Bearings, housing of bearings, bushes etc.
  - 4. Base plates
  - 5. Down pipe, guides joints
  - 6. Operating mechanism, aux switch, size and thickness of box, degree of protection, gland plate, gland etc.
  - 7. Nuts, bolt and fastenersOffers without the above information or with incomplete information may be rejected.
- ii. All live parts shall be designed to have smooth surfaces without any sharp points, edges and other corona producing surfaces so as to eliminate corona at specified extinction voltage or at 1.1x rated voltage if extinction voltage is not specified.

### 3.9 Fasteners

Nuts, bolts and washers of 5/8" and higher size shall be hot dip galvanised. The bolts used on tapped holes of insulator cap shall be galvanised by centrifuge process to avoid excess deposition of zinc on threads. Nuts, bolts and washers of less than 5/8" size shall be non-magnetic stainless steel.

### 3.10 Contacts

Contacts shall be made out of hard drawn electrolytic grade copper. Arcing contacts wherever provided shall close first and open last. The contacts shall be silver plated (10 to 15 microns).

### 3.11 Terminal Pad

It shall be made out of electrolytic copper heavily silver plated (15 microns). The terminal pads shall be suitable for connection to 40x40 mm terminal connector.

3.12 Mounting of Contacts

Fixed contacts shall be mounted on 6 mm thick 100x50 mm M.S. Galvanised channel welded to 10 mm thick M.S. plate with holes for fixing on insulators. Slots shall be provided for marginal adjustment of height of contacts.

3.13 Moving Blades

Contact surface of moving blades shall be heavily silver plated to 15 microns thick. The surface shall be wiped during closing and opening operations to remove any oxide deposition on the contacts.

3.14 Bearings

Rotating insulator shall be mounted on a housing with bearings. Two numbers of bearings with at least 50 mm ID and 80 mm distance between the bearings shall be provided. The bearings shall be of reputed make and lubricated for lifetime. Other parts like bushes, joints springs etc shall be so designed that no lubrication shall be required during the service.

3.15 Tandem Pipe

Tandem pipes shall be of at least 25 mm ID single piece and class B. One tandem pipe shall be used for phase coupling of double break isolator. Wherever unavoidable sliding clamps may be used, these clamps shall be made out of one piece of at least 6 mm thick MS plate.

3.16 Base

Each base of isolator shall be provided with a rigid base fabricated from steel sections. The base shall be suitable for mounting on support structures. Fabrication, welding etc shall be done by suitable jig, templates and devices used for production of the base shall be furnished with the contractor.

3.17 Supporting Structures

- i. The contractor shall quote unit prices for 33 kV Isolator which shall include price of support structure for the isolator offered. These support structures shall be fabricated out of galvanized ERW pipe conforming to IS 1239. Support structure for few vertically mounted isolators shall be suitable for mounting those vertically operated isolators
- ii. The support structure shall be suitable for mounting operating mechanism and guides. It shall be designed to withstand short circuit forces, wind pressure, seismic forces etc. along with the operating forces, vibrations, shocks etc. at actual site conditions with adequate factor of safety

3.18 Terminal Connectors

- i. The contractor shall quote the unit price for terminal connectors also.

- ii. It should be made of EC grade of aluminum along with suitable bimetallic plate of min. 1 mm thickness. It should be crimping type & suitable for 0.2 sq. inch single ACSR conductor

3.19 Assembly

- i. The disconnecter shall be fully assembled at the works of the contractor and all operations of the fully assembled disconnecter shall be checked at the manufacturers works.

3.20 Painting , Galvanizing and Climate Proofing

- i. All interiors and exteriors of enclosures, cabinets and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, grease and other foreign materials. After cleaning two coats of zinc oxide primer shall be given by suitable stoving and air drying etc. Colour of the final paint shall be epoxy light gray.
- ii. Paint inside the metallic housing shall be of anti-condensation type and the paint on outer surfaces shall be suitable for out door condition.
- iii. Galvanisation shall be done after completion of the fabrication and should be capable of preventing corrosion in view of severe climatic conditions.

3.21 Tests

Type Tests:

- i. The equipment offered should be fully type tested as per relevant standards and contractor shall furnish a set of type test reports (of **within 5 years**) along with the offer.
- ii. In order to make type test representative, all type tests must be carried out by erecting disconnecter on its foundation and after fitting the actual operating mechanism of the disconnecter and using normal insulators to be used in real case.

Routine Tests & Acceptance Test:

- i. All acceptance and routine tests as stipulated in the relevant standards shall be carried out by the supplier/contractor in presence of owner representative.
- ii. Mechanical operation test (Routine test) shall be conducted on the complete disconnecter and earth switch.
- iii. Immediately after finalization of the Programme of type/acceptance/routine testing, the supplier/contractor shall give three weeks advance intimation to the owner, to enable him to depute his representative for witnessing the tests.

List of the relevant standards:

- a. Indian Standards: 1818, 9921, 2544, 13947, 4691, 325, 4722, 2629, 4759, 2633, 1573, 3033, 2016, 3961, 5561, 1554, 5578, 11353, 2623
- b. IEC: 129, 168,
- c. Indian Electricity Rules 1956

Only the latest versions of all these standards shall be followed.

**Technical Parameters:**

S. No.	Parameter	Unit	Requirements
1	Rated Freq.	Hz.	50
2	System Neutral Earthing		Effectively earthed
3	No. of phase(poles)	No.	3
4	Temp. rise	Deg. C	As per standards IS/IEC
5	Safe duration of overload	Minutes	
	a) 150 % of rated current		5
	b) 120 % of rated current		30
6	Rated voltage	KV rms	33 kV
7	Type of isolator (AB)		DBCR
8	Rated normal current	Amps.	800
9	Rated short time withstand current of MS & EB for 3 second	KA rms	25
10	Rated peak current of MS & EB	KA peak	63
11	Rated short circuit make current of EB	KA peak	63
12	Derating factor		unity
13	Basic Insulation Level		
	1) Lightning Impulse withstand voltage	KV peak	
	a) Pole to earth & between poles		170
	b) Across isolating distance		195
	2) Rated power freq. withstand voltage	KV rms	
	a) Pole to earth & between poles		70
	b) Across isolating distance		80

14	Min. creepage distance	mm	900
15	Phase to phase spacing for installation	mm	1500
16	Min. clearances	mm	
	a) Phase to earth		430
	b) Between rotating post and fixed post on one phase		485
17	Height of center line of terminal pad above ground level	mm	3885
18	Special Requirements: a) Isolator main switch (MS) shall be required to make or break the line charging current when no significant change in voltage occurs across the isolating distance on account of make or break b) The isolator required is not with “Turn and twist mechanism” . It must be rotating type.		

S.No.	Description	Material	Size
1	Base Channel	MS Galvanized	100 x 50 x 6 mm
2	Base Support Channel	MS Galvanized	100 x 50 x 6 mm
3	Base for 4 <sup>th</sup> bearing	MS Galvanized	75 x 50 x 6 mm
4	Tandem pipe	GI Pipe	25 NB, class ‘B’ 3200 mm long
5	Down Pipe	GI Pipe	50 NB, Class ‘B’ 1900 mm long
6	Earthing Terminal		M16, Bolts with Nut

**GUARANTEED TECHNICAL PARTICULARS OF 33 KV ISOLATORS**

<b>A.</b>	Name of tenderer / contractor	
<b>B.</b>	Tender specification No.	
<b>1</b>	Name of manufacturer	
<b>2</b>	Manufacturer's type	
<b>3</b>	Standards to which the equipment conforms	
<b>4</b>	Frequency (Hz.)	
<b>5</b>	Rated voltage (KV rms)	
<b>6</b>	Max. design voltage at which the isolator can operate (KV rms)	
<b>7</b>	Continuous current rating (Amp. Rms)	
<b>8</b>	Rated short time current	
	i) for 3 sec. (KA rms)	
	ii) rated peak short time current (KA peak)	
<b>9</b>	Current density at the min. cross section of (Amp./sq. mm)	
	i) Moving blades	
	ii) Terminal pad	
	iii) Contacts	
	iv) Terminal connector	
<b>10</b>	Derating factor for specified site conditions	
<b>11</b>	Insulation levels	
	i) Dry impulse withstand voltage (KV peak)	
	a) Phase to earth	
	b) Isolating distance	

	ii) Wet power freq. Withstand voltage (KV rms)	
	a) Phase to earth	
	b) Isolating distance	
<b>12</b>	Min. clearance in air (mm)	
	i) Center to center distance between poles	
	ii) Between live parts & earth	
	iii) Between poles on one phase	
<b>13</b>	Design & Construction	
	i) No. of insulators per pole	
	ii) No. of break per pole	
	a) Main switch	
	b) Earth Switch	
	iii) Type of opening/closing mechanism	
	iv) Contacts	
	a) Material & grade	
	b) Thickness of silver plating on contact surface	
	c) Effective Cross sectional area (sq.mm.)	
	1. Main switch	
	2. Earth switch	
	d) No. of operations the isolator can make without deterioration of contacts	
	1. Main switch	
	2. Earth switch	

	v) Moving blades	
	a) Material & grade	
	b) Thickness s of silver plating on contact surface	
	c) Effective Cross sectional area (sq.mm.)	
	1. Main switch	
	2. Earth switch	
	vi) Contact support	
	a) Material & size of channel	
	b) Material & size of plate	
	vii) Rain hood & material size	
	viii) Nuts & bolts	
	a) Size, material & grade in live parts	
	b) Size, material & grade in other parts	
	ix) base plate below rotating insulator	
	a) Material	
	b) Size	
	c) Thickness	
	x) Bearing	
	a) material of housing	
	b) material of bearing	
	c) No. of bearing, location & size	
	d) ID of bearing	

	Distance between 2 bearing	
	Tandem pipe	
	<ul style="list-style-type: none"> <li>a) Size</li> <li>b) Length</li> <li>c) Class</li> <li>d) Numbers</li> <li>e) Size of bolt &amp; shackles</li> <li>f) No. of clamps</li> <li>g) Material of clamps</li> <li>h) Thickness of clamps</li> </ul>	
	Type of interlocks	
	<p>Down pipe</p> <ul style="list-style-type: none"> <li>a) Size</li> <li>b) Length</li> <li>c) Class</li> </ul>	
	<p>Type of universal/swivel joint</p> <ul style="list-style-type: none"> <li>a) Bearing &amp; down pipe</li> <li>b) Between down pipe &amp; operating mechanism</li> </ul>	
	<p>Operating mechanism</p> <ul style="list-style-type: none"> <li>a) Control cabinet <ul style="list-style-type: none"> <li>i) material &amp; thickness</li> <li>ii) Degree of protection</li> <li>iii) Type , size &amp; no. of cable glands</li> <li>iv) Whether removable gland plate provided</li> </ul> </li> </ul> <p>make, type, rating &amp; quantity of insulated wires</p>	
	<p>Insulators</p> <ul style="list-style-type: none"> <li>a) Type</li> <li>b) No. of units per insulator</li> <li>c) Height of each insulator stack</li> </ul>	

	<p>(mm)</p> <p>d) No.of holes, size &amp; pitch circle diameter (mm)</p> <p>e) Rated voltage</p> <p>f) Dry power freq. withstand voltage (KV rms)</p> <p>g) Wet power freq. withstand voltage (KV rms)</p> <p>h) Impulse withstand voltage (KV peak)</p> <p>i) Visual discharge voltage level (KV rms)</p> <p>j) Creepage distance (mm)</p>	
	<p>xvii) Base Channel</p> <p>Material</p> <p>Size</p>	
	<p>xviii) Support structure</p> <p>a) Material</p> <p>b) Size</p>	
	<p>xix) Support structure</p> <p>a) material</p> <p>b) size</p>	
	<p>xx) Terminal connector</p> <p>a) Clamp body</p> <p>j) Material</p> <p>ii) Thickness of bimetallic plate</p> <p>iii) Area of min. cross section</p> <p>b) material of bolts &amp; nuts size</p> <p>c) type of washers used</p>	
	<p>xxi) material of braids</p>	
	<p>List of bought out items.</p>	