

**KARNATAKA POWER TRANSMISSION CORPORATION LIMITED**

**SECTION- ISOLATOR**

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## **1.0 DESIGN FEATURES**

### **1.1 General**

- 1.1.1 The Isolators and accessories shall conform in general to IEC: 62271-102 (or IS: 9921) except to the extent explicitly modified in specification and shall be in accordance with requirement of the **Section GTR**.
- 1.1.2 Isolators shall be outdoor, off-load type. Earth switches shall be provided on Isolators wherever called for.
- 1.1.3 Owner reserves the right to choose all isolators of anyone of the types specified or any combination of the same with one/two earth switches or without earth switches. Bids would however, be analysed based on quantities of each type as specified.
- 1.1.4 Complete isolator with all the necessary items for successful operation shall be supplied including but not limited to the following.
- 1.1.5 Isolator assembled with complete insulators, base frame, linkages, operating mechanism, control cabinet, interlocks, support structures etc.
- 1.1.6 All necessary parts to provide a complete and operable isolator installation, control parts and other devices whether specifically called for herein or not.
- 1.1.7 The isolator shall be designed for use in the geographic and meteorological conditions as given in Section - GTR.
- 1.1.8 One central control cabinet for each isolator/earth switch and one control cabinet for each pole as applicable with all the required electrical devices mounted therein and the necessary terminal blocks for termination of interpole wiring to be done by Contractor in case of individual pole operated isolators/earth switches.

### **1.2 Constructional Features**

- 1.2.1 Isolator/earthing switch shall be complete with all parts and accessories.

1.2.2 Base channels and other structural steel members such as operating pipes, phase coupling rods etc., operating mechanism boxes, bolts, pins etc. shall be hot dip galvanized.

1.2.3 The features and constructional details of Break Isolators, earth switches and accessories shall be in accordance with requirements stated hereunder:

1.2.4 Contacts:

- a) The isolators shall be provided with high pressure current carrying contacts on the hinge and jaw ends and all contact surface shall be silver plated. The thickness of silver plating should preferably be not less than 25 microns. The contacts shall be accurately machined and self aligned.
- b) The contacts shall be self aligning and self cleaning and so designed that binding cannot occur after remaining closed for prolonged periods of time in a heavily polluted atmosphere.
- c) No undue wear or scuffing shall be evident during the mechanical endurance tests. Contacts and spring shall be designed so that readjustments in contact pressure shall not be necessary throughout the life of the isolator or earthing switch. Each contact or pair of contacts shall be independently sprung so that full pressure is maintained on all contacts at all time.
- d) Contact springs shall not carry any current and shall not lose their characteristics due to heating effects.
- e) The moving contact of **Double** break isolator shall have turn-and -twist type or other suitable type of locking arrangement to ensure adequate contact pressure.

1.2.5 Base:

Each single pole of the isolator shall be provided with a complete galvanised steel base / stool provided with holes and designed for mounting on a supporting structure.

1.2.6 Blades:

- a) All metal parts shall be of non-rusting and non-corroding material. All current carrying parts shall be made from high

conductivity electrolytic copper/Aluminium. Bolts, screws and pins shall be provided with lock washers. Keys or equivalent locking facilities if provided on current carrying parts, shall be made of copper silicon alloy or stainless steel or equivalent. The bolts or pins used in current carrying parts shall be made of non-corroding material. All ferrous castings except current carrying parts shall be made of malleable cast iron or cast-steel. No grey iron shall be used in the manufacture of any part of the isolator.

- b) The live parts shall be designed to eliminate sharp joints, edges and other corona producing surfaces and where this is impracticable adequate corona shield shall be provided. Corona shields/rings etc., shall be made up of aluminum/aluminum alloy.
- c) The isolators and earth switches shall be so constructed that the switch blade shall be locked in the open/closed position and shall not fall to the closed/open position in case the operating shaft get disconnected.
- d) Isolators and earthing switches including their operating parts shall be such that they cannot be dislodged from their open or closed positions by short circuit forces, gravity, wind pressure, vibrations, shocks, or accidental touching of the connecting rods of the operating mechanism.
- e) The switch shall be designed such that no lubrication of any part is required except at very infrequent intervals. i.e. after every 1000 operations or after 5 years whichever is earlier.

#### 1.2.7 Insulator:

- a) The insulator shall conform to IS: 2544 and/or IEC-60168. The porcelain of the insulator shall conform to the requirements stipulated in specifications and shall have minimum cantilever strength of 1000Kgs/800Kgs for 420/245kV Insulators respectively.
- b) Pressure due to the contact shall not be transferred to the insulators after the main blades are fully closed.
- c) The parameters of the insulators shall meet the requirements specified in Section GTR.

- 1.2.8 Current density, to be adopted, for all parts of the isolator and terminal connector shall not exceed following limits:
- |   |           |               |
|---|-----------|---------------|
| a) Hollow tube sections:                | Copper    | 2.0A / sq.mm  |
|   | Aluminium | 1.25 A/ sq.mm |
| b) Other sections & terminal connectors | Copper    | 1.6 A / sq.mm |
|   | Aluminium | 1.0 A/ sq.mm  |

		220KV Isolators	110KV Isolators	66KV Isolators	33KV Isolators
a)	Bore dia of 32mm tandem pipe	40mm	40mm		32mm
b)	Bore dia of down operating 50mm pipe	50mm	50mm		50mm

Further outside diameter and thickness of pipe shall be as follows as per table - 3 of IS : 1239 (Part - 1) 1990. Mild steel tubes. - Heavy.

S1. No.	Nominal Bore in	outer dia Maximum (mm)	outer dia Minimum(mm)	Minimum thickness
1.	32	42.9	42	4
2.	40	48.8	47.9	4
3.	50	60.8	59.7	4.5

i. Tandem pipe:

Two Nos. of tandem pipe shall be used for phase coupling of double break isolator. Base plate of insulators for connection of tandem pipe shall be made out of one piece of at least 10 mm. thick MS plate. Bolt and shackle device shall be used to connect tandem pipe to the base plate. Wherever unavoidable, sliding clamps may be used. These clamps shall be made out of at least 10 mm thick MS plate with four(4) nos. of nuts and bolts. A grubscrew shall be provided for securing connection of tandem pipes.

ii) The pipe shall be terminated into a suitable swivel or universal type joint between the insulator bottom bearing an the operating mechanism to take cares of marginal angular misalignment at site. All brackets, guides, etc., shall be mounted on the base of the isolator. Arrangement of mounting any guide, bracket, mechanism and the base shall not be accepted, for upright mounting type isolator.

## **2.0 DUTY REQUIREMENTS:**

2.1 The disconnecting switches shall be fully Double/Center break type. The Double/Center break type shall have contact blades moving in horizontal plane.

2.2 Isolators and earth switches shall be capable of withstanding the dynamic and thermal effects of the maximum possible short circuit current of the systems in their closed position. They shall be constructed such that they do not open under influence of short circuit current.

2.3 The earth switches, wherever provided, shall be constructionally interlocked so that the earth switches can be operated only when the isolator is open and vice versa. The constructional interlocks shall be

built in construction of isolator and shall be in addition to the electrical and mechanical interlocks provided in the operating mechanism. Suitable mechanical arrangements shall be provided for delinking electrical drive for manual operation.

- 2.4 In addition to the constructional interlock, isolator and earth switches shall have provision to prevent their electrical and manual operation unless the associated and other interlocking conditions are met. All these interlocks shall be of fail safe type. Suitable individual interlocking coil arrangements shall be provided. The interlocking coil shall be suitable for continuous operation from DC supply and within a variation range as stipulated in Section C.
- 2.5 The earthing switches shall be capable of discharging trapped charges of the associated lines.
- 2.6 The isolator shall be capable of making/breaking normal currents when no significant change in voltage occurs across the terminals of each pole of isolator on account of make/break operation.
- 2.7 The isolator shall be capable of making/breaking magnetising current of 0.7A at 0.15 power factor and capacitive current of 0.7A at 0.15 power factor at rated voltage.
- 2.8 Isolator shall be of extended mechanical endurance class - M2 as per IEC-62271-102.

### **3.0 ACCESSORIES**

#### **3.1 Earthing Pads**

Each pole of the Isolator shall be provided with two earthing pads of non-corroding material at opposite ends, brazed to the channel base. Flexible tinned copper earth connectors shall be provided for connecting operating handles of Isolators and earthing switches to the earthing system.

#### **3.2 Name Plate**

A weather-proof and corrosion-proof name plate shall be provided on Isolators, earthing switches and operating devices. The name plates shall conform to requirements of IEC incorporating year of manufacture.

#### **3.3 Earthing Switch**



- 3.3.1 Earthing switch, whenever specified in Data Sheet A1, shall form an integral part of each pole of the Isolator.
- 3.3.2 Where earthing switches are specified these shall include the complete operating mechanism and auxiliary contacts.
- 3.3.3 The earthing switches shall form an integral part of the isolator and shall be mounted on the base frame of the isolator.
- 3.3.4 Earthing switches shall be only locally operated.
- 3.3.5 The earthing switches shall be constructionally interlocked with the isolator so that the earthing switches can be operated only when the isolator is open and vice versa. The constructional interlocks shall be built in construction of isolator and shall be in addition to the electrical interlocks.
- 3.3.6 Suitable mechanical arrangement shall be provided for de-linking electrical drive for manual operation.
- 3.3.7 Each earth switch shall be provided with flexible copper/Aluminum braids for connection to earth terminal. These braids shall have the same short time current carrying capacity as the earth blade. The transfer of fault current through swivel connection will not be accepted.
- 3.3.8 The plane of movement and final position of the earth blades shall be such that adequate electrical clearances are obtained from adjacent live parts in the course of its movement between ON and OFF position.
- 3.3.9 The frame of each isolator and earthing switches shall be provided with two reliable earth terminals for connection to the earth mat.
- 3.3.10 Isolator design shall be such as to permit addition of earth switches at a future date. It should be possible to interchange position of earth switch to either side.
- 3.3.11 The earth switch should be able to carry the same fault current as the main blades of the Isolators and shall withstand dynamic stresses.
- 3.3.12 The earth switches shall also comply with the requirements of IEC-62271-102, in respect of induced current switching duty as defined

for Class-B and short circuit making capability class E-0 for earthing switches.

### **3.4 Interlocks**

3.4.1 Isolators and earthing switches shall be provided with padlocking facility to lock them in fully open or fully closed positions. Padlock with keys shall be supplied with the Isolator.

3.4.2 Isolator shall be provided with electrical interlocking feature. This shall be in the form of bolt interlock comprising an interlock coil of latch-in type to lock the Isolator driving shaft and thus prevent Isolator operation in the latch-in condition. It shall be possible to release the latch by energising the interlock coil when certain preset conditions of PURCHASER's external interlocking scheme are fulfilled. For this purpose the VENDOR shall provide facilities for wiring PURCHASER's external interlocking contacts both in Isolator opening and closing circuits. Further, a separate bypass switch or a similar facility shall be provided on the local control cabinet to facilitate emergency manual operation of Isolator. Electrical interlocking arrangement shall be fail-safe type.

### **3.5 Operating Mechanism and Controls**

#### **3.5.1 Operating mechanism:**

- a) The bidder shall offer motor operated Isolators and earth switches.
- b) Limit switches for control shall be fitted on the isolator/earth switch shaft, within the cabinet to sense the open and close positions of the isolators and earth switches.
- c) After final adjustment has been made, it shall not be possible for any part of the mechanism to be displaced at any point in the travel sufficient enough to allow improper functioning of the isolator when the isolator is opened or closed at any speed. All holes in cranks, linkage etc. having moving pins shall be drilled to accurate fit so as to maintain the minimum amount of slack and lot-motion in the entire mechanism.
- d) Control cabinet/operating mechanism box shall conform to the requirement stipulated in specifications and shall be made of aluminum sheet of adequate thickness (minimum 3 mm) or stainless steel grade 304 of minimum thickness of 2 mm.

- e) A “Local/Remote” selector switch and a set of open/ close push buttons shall be provided on the control cabinet of the isolator to permit its operation through local or remote push buttons.
- f) Provision shall be made in the control cabinet to disconnect power supply to prevent local/remote power operation.
- g) Motor shall be an AC motor and conform to the requirements of the Section GTR.
- h) Suitable reduction gearing shall be provided between the motor and the drive shaft of the isolator. The mechanism shall stop immediately when motor supply is switched off. If necessary a quick electromechanical brake shall be fitted on the higher speed shaft to effect rapid braking.
- i) Manual operation facility (with handle) should be provided with necessary interlock to disconnect motor.
- j) Gear should be of forged material suitably chosen to avoid bending/jamming on operation after a prolonged period of non operation. Also all gear and connected material should be so chosen/surface treated to avoid rusting.
- k) The test report for blocked rotor test of motor shall be submitted as per the requirement of Technical Specification, Section GTR.
- l) Only stranded conductor shall be used for wiring. Minimum size of the conductor for control circuit wiring shall be 1.5 sq.mm. (Copper).
- m) Operated mechanism shall be located such that it can be directly mounted on any one of the support structures.

### 3.5.2 Operation:

- a) The main Isolator and earth switches shall be individual-pole, electrically-ganged operated for 420 kV and **electrically/mechanically ganged operated for 245kV**. For electrically-ganged Main Isolator and earth switches, the supply of required cables between poles (Master & followers) is in the scope of manufacturer. The operating mechanism of the three poles shall be well synchronized and interlocked. However, it

shall be possible, for maintenance & alignment purposes, to operate each pole individually, for which selector switch shall be provided in the Master-pole control cabinet & suitable wiring shall be done to achieve this feature.

- b) The design shall be such as to provide maximum reliability under all service conditions. All operating linkages carrying mechanical loads shall be designed for negligible deflection. The length of inter insulator and interpole operating rods shall be capable of adjustments, by means of screw thread which can be locked with a lock nut after an adjustment has been made. The isolator and earth switches shall be provided with “over center” device in the operating mechanism to prevent accidental opening by wind, vibration, short circuit forces or movement of the support structures.
- c) Each isolator/pole of isolator and earth switch shall be provided with a manual operating handle enabling one man to open or close the isolator with ease in one movement while standing at ground level. Non- detachable type manual operating handle shall have provision for padlocking. For detachable type manual operating handles, suitable provision shall be made inside the operating mechanism box for parking the detached handles. The provision of manual operation shall be located at a height of 1000 mm from the base of isolator support structure.
- d) The isolator shall be provided with positive continuous control throughout the entire cycle of operation. The operating pipes and rods shall be sufficiently rigid to maintain positive control under the most adverse conditions and when operated in tension or compression for isolator closing. They shall also be capable of withstanding all torsional and bending stresses due to operation of the isolator. Wherever supported the operating rods shall be provided with bearings on either ends. The operating rods/ pipes shall be provided with suitable universal couplings to account for any angular misalignment.
- e) All rotating parts shall be provided with grease packed roller or ball bearings in sealed housings designed to prevent the ingress of moisture, dirt or other foreign matter. Bearings pressure shall be kept low to ensure long life and ease of operation. Locking pins wherever used shall be rustproof.

- f) Signaling of closed position shall not take place unless it is certain that the movable contacts, have reached a position in which rated normal current, peak withstand current and short time withstand current can be carried safely. Signaling of open position shall not take place unless movable contacts have reached a position such that clearance between contacts is at least 80% of the isolating distance.
- g) The position of movable contact system (main blades) of each of the Isolators and earthing switches shall be indicated by a mechanical indicator at the lower end of the vertical rod of shaft for the Isolators and earthing switch. The indicator shall be of metal and shall be visible from operating level.
- h) The contractor shall furnish the following details along with quality norms, during detailed engineering stage.
  - (i) Current transfer arrangement from main blades of isolator along with milli volt drop immediately across transfer point.
  - (ii) Details to demonstrate smooth transfer of rotary motion from motor shaft to the insulator along with stoppers to prevent over travel.

### 3.5.3 Motor Drive

- a) For power operated Isolators, the drive motors shall conform to the requirement of chapter-GTR.
- b) Motors shall be totally enclosed, weather-proof, outdoor type and tropicalised. Magnetic contactor type of starters suitable for direct-on-line duty shall be provided for control of motors.
- c) Limit switches for motor control shall be fitted on the Isolator shaft, within the cabinet, to sense open and close positions of the Isolator.

## 4.0 SUPPORTING STRUCTURES

- 4.1 Isolators shall be suitable for mounting on support structures as specified in Section GTR. The VENDOR shall furnish detailed dimensioned drawings indicating weights and all fixing details and relative locations of chassis, operating mechanism box and operating handles etc. Vendor shall also furnish orientation GA showing

positions of Main Blades and Earth Blade in open condition along with Control Box.

## **5.0 TERMINAL CONNECTOR PAD:**

The isolator terminal pads/studs shall be made of high quality copper or aluminum and shall be conforming to Australian standard AS-2935 & IS 5561 for rated current. The terminal pad shall have protective covers which shall be removed before interconnections.

## **6.0 TESTS**

Type tested Isolators shall be offered. The type test reports shall not be older than FIFTEEN (15) years as on the last date of submission of bid.

### **a) For Isolators manufactured in India:**

- i). The type tests on indigenous equipment for which testing facility is available in India, should have been conducted in any independent laboratories approved by the Government or the laboratories accredited by the National accreditation body of the country like Central Power Research Institute (CPRI), Electrical Research and Development Association (ERDA), etc.
- ii). The type tests on indigenous equipment, for which testing facility is not available in India, should have been conducted in a laboratory of foreign country accredited by National accreditation body of that country.
- iii). The type tests conducted in-house by a manufacturer shall also be acceptable provided the laboratory is accredited by National accreditation body of the country and the tests has been conducted in the presence of a representative of NABL accredited laboratory or any of the purchasing utilities or CEA in that order. Such type test reports shall record the details of such witness including the signature/authentication in the type test report.

### **b) For Isolators manufactured Abroad:**

- i). Type tests on imported equipment should have been conducted in an Indian Laboratory or foreign laboratory accredited by National accreditation body of the country where the Type test has been conducted.
- ii). The type tests conducted in-house by a manufacturer shall also be acceptable provided the laboratory is accredited by National accreditation body of the country and the tests has been conducted in the presence of a representative of accredited

laboratory or any of the purchasing utilities or CEA in that order. Such type test reports shall record the details of such witness including the signature/authentication in the type test report. In case of in-house type tested imported equipment of foreign OEM, the term "Purchasing Utility" covers the foreign Utility who has purchased that equipment.

The isolator along with its earthing switch and operating mechanism should have been type tested as per IEC/IS and shall be subjected to routine tests in accordance with IEC-62271-102. Power frequency voltage withstand tests shall be performed on at least one completely assembled isolator pole of each type. Alternatively, power frequency test may be performed on two nos. of Post Insulators (complete) for each voltage rating and type of Isolator. Minimum 1000 Nos. mechanical operations in line with mechanical endurance tests, M0 duty shall be carried out on one isolator out of every lot of isolator, assembled completely with all accessories as acceptance test for the lot. The travel characteristics measured at a suitable location in the base of insulator along with motor current/ current drawn during the entire travel duration are to be recorded at the start of and completion of test and shall not vary by more than  $\pm 10\%$  after completion of 10000 cycles of operation. After completion of tests, mechanical interlock operation to be checked.

- 6.1 The test equipment, meters, instruments etc. used for testing shall be calibrated at recognised test laboratories at regular intervals and valid certificates shall be made available to the PURCHASER's representative at the time of testing. The calibrating instruments used as standards shall be traceable to national/ international standards.
- 6.2 The test reports of the type tests and the following additional type tests shall also be submitted for the Purchaser's review, along with bid.
  - a) Radio interference voltage test as per Annexure-A of Section GTR
  - b) Corona Extinction Voltage test as per Annexure-A of Section GTR
  - c) Seismic withstand test on isolator mounted on Support structure as per Annexure-B of Section GTR

- 6.3 The test shall be performed in the following position :

Isolator open	E/S Closed
Isolator open	E/S Open
Isolator Closed	E/S Open

## 7.0 **TECHNICAL PARAMETERS**

(In addition to those specified under chapter-GTR)

### **A. 420 kV ISOLATORS:**

A1.1	Type	Outdoor
A1.2	Rated current at 50°C ambient temperature	2000A/3150 A (As applicable)
A1.3	Rated short time withstand current of isolator and earth switch (for 1 Sec.)	40kA/50kA/63 kA (as applicable)
A1.4	Type & Endurance class of Disconnecter and mounting	Double/Center Break, M2 Endurance class (10,000 operations)
A1.5	Endurance class of Earth switch	MO class (1,000 operations)
A1.6	Power frequency withstand voltage – KV (rms)	Ph-E & between phases 520kV rms and 610kV rms (Across isolating distance)
A1.7	Lightning impulse withstand voltage- (kVp)	Ph-E & between phases 1425kVp and 1425 (+240)kVp (Across isolating distance)



A1.8	Switching impulse withstand voltage -(kVp)	1050kVp (for Ph-E & Across open switching device) 1575kVp (For Ph-Ph) 900(+345)kVp (Across isolating distance)
A1.9	Rated dynamic short circuit withstand current isolator and earth switch	100kAp/125kAp/157.5 kAp (as applicable)
A1.10	Temperature rise over design ambient temperature	As per table V of IEC-694.
A1.11	Rated mechanical terminal load.	As per table III of IEC-62271-102 or as per value calculated in Section-GTR Whichever is higher.
A1.12	Operating mechanism of isolator and earth switch	A.C. Motor operated for isolator Earth-switch
A1.13	No. of auxiliary contacts on each isolator	10 NO + 10 NC contacts wired to terminal block Purchaser's use in future.
A1.14	No. of auxiliary contacts on each earthing switch	5 NO + 5 NC Contacts wired to terminal block Purchaser's use in future.
A1.15	Operating time	12 sec. or less

A.1.16	Number of terminal in control cabinet (Interpole cabling shall be supplied by Contractor)	All contacts & control circuits are to be wired upto control cabinet plus 20% spare terminals evenly distributed.
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**B. 245 kV ISOLATORS:**

B1.1	Type	Outdoor
B1.2	Rated current at 50°C ambient temperature	1600A / 2500/ <b>3000</b> A (As applicable).
B1.3	Rated short time withstand current of isolator and earth switch (for 1 Sec.)	40 kA / 50 kA (as applicable)
B1.4	Rated dynamic short circuit withstand current of isolator and earth switch	100 kAp / 125 kAp (as
B1.5	Temperature rise over ambient temperature	As per table V of IEC-694.
B1.6	Rated mechanical terminal load	As per table III of IEC-62271- as per value calculated in GTR whichever is higher.
B1.7	Operating mechanism of isolator/earth switch	A.C. Motor operated
B1.8	No. of auxiliary contacts on each isolator	Besides requirement of this bidder shall wire up <b>10</b> NO + TBs (Reversible) for future use.
B1.9	No. of auxiliary contacts on each earthing switch	Besides requirement of this bidder shall wire up <b>5</b> NO + <b>5</b> TBs (Reversible) for future use.
B1.10	Operating time	12 sec. or less

B1.11	Number of terminal in control (Interpole cabling shall be supplied by Contractor)	All contacts & control circuits are to be wired upto control 24 spare terminals evenly distributed.
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### C. 72.5 kV and 36 kV Isolator

C1.1 Rated voltage	72.5 kV	36kV
C1.2 Rated current	2000 A	400 A
C1.3.Standards	IEC 62271-102	IEC 62271-102
C1.4.Rated short time withstand (in KA)	25KA for 3 sec.	25KA for 3 sec.
C1.5. Operating drive operated	AC Motor (isol) AC motor/mannual operated (E/S)	Manual operated
C1.6.Type break	Double/Center Isolator without E/S, 3 pole, outdoor, Gang operated	Double/Center break Isolator without E/S, 3 pole, outdoor, Gang operated
C1.7.Interlock	Electrical interlock with circuit breaker. Mechanical castle key interlock to be provided between electrical and manual operation.	Pad locking of operating handle for preventing unauthorised operation.
C1.8.Construction details	All ferrous parts to be galvanized except nuts and bolts which shall be electroplated as per relevant IS	All ferrous parts to be galvanized except nuts and bolts which shall be electroplated as per relevant IS



C1.9. Terminal connector      To suit site conditions and layout requirements.

C1.10 Operating time      12 seconds or less --

## **8.0    PRE-COMMISSIONING TESTS**

Contractor shall perform any additional test based on specialties of the items as per the field Q.P./instructions of the equipment Supplier or Purchaser without any extra cost to the Purchaser. The Contractor shall arrange all instruments required for conducting these below site-tests along with calibration certificates and shall furnish the list of instruments to the Purchaser for approval.

- a) Insulation resistance of each pole.
- b) Manual and electrical operation and interlocks.
- c) Insulation resistance of control circuits and motors.
- d) Ground connections.
- e) Contact resistance of Main isolator contacts and Earthing contacts.
- f) Proper alignment so as to minimise to the extreme possible the vibration during operation.
- g) Measurement of operating Torque for isolator and Earth switch.
- h) Resistance of operating and interlocks coils.
- i) Functional check of the control schematic and electrical & mechanical interlocks.
- j) 50 operations test on isolator and earth switch.

The contractor shall ensure that erection, testing and commissioning of Isolators above 72.5kV class shall be carried out under the supervision of the Isolator manufacturer's representative. The commissioning report shall be signed by the manufacturers representative

## **9.0 SPARE PARTS AND MAINTENANCE EQUIPMENT:**

Bidder shall include in his proposal mandatory spare parts in accordance with the requirements stipulated in Section – Project.

## **10.0 ASSEMBLY**

Direct delivery of insulators from insulator manufacturer's works is not preferred and is subject to PURCHASER's approval. Isolators shall be completely assembled at the works to ascertain that all the parts fit correctly.

### **APPLICABLE STANDARDS**

<b>SR.N O</b>	<b>BRIEF TITLE</b>	<b>REFERENCE NO. OF STANDARD</b>
1.0	ISOLATORS	<input type="checkbox"/> IS 9921 <input type="checkbox"/> IEC 129 <input type="checkbox"/> IEC 62271-102
2.0	INSULATORS – HIGH VOLTAGE	<input type="checkbox"/> IS 2544 <input type="checkbox"/> IEC 273
3.0	HOT DIP GALVANISING	<input type="checkbox"/> IS 2629 <input type="checkbox"/> IS 2633
4.0	CONNECTORS	<input type="checkbox"/> IS 5561

### **NOTES:**

1. EQUIPMENT, ACCESSORIES, COMPONENT PARTS, RAW MATERIAL AND TESTS SHALL IN GENERAL CONFORM TO ☐ IS ☐ BS ☐ IEC
2. ONLY THE MAIN APPLICABLE STANDARDS ARE GIVEN ABOVE. BIDDER SHALL, HOWEVER, NOTE THAT ALL PARTS OF THESE STANDARDS AS WELL AS OTHER STANDARDS REFERRED TO THEREIN ARE ALSO APPLICABLE.

## **DATA TO BE FURNISHED AFTER AWARD OF CONTRACT**

- 1.0        Drawings to be submitted for approval
- 1.1        Assembly drawing showing plan and elevation of Isolator and earthing switch incorporating mounting dimensions, overall dimensions, weight etc. Relative location of Main Blades and Earth Blades in open positions, Drive/Control Box for Main Blades and Earth Blades.
- 1.2        Bill of materials
- 1.3        Control wiring diagram
- 1.4        Dimensional drawing for the line and earth side terminals of the Isolator. Also dimensional drawing of the clamps and connections for line and earth side terminals.
- 2.0        Additional drawings to be submitted for purchaser's information
- 2.1        Orientation, location and mounting details of operating mechanism box, operating handle and operating devices.
- 2.2        Details of guides and guide bearings to be mounted on the supporting structure.
- 2.3        Details of jaw contacts and main Isolator blades.
- 2.4        Terminal stud details.
- 2.5        Drawings necessary for design and fabrication of Isolator supporting structure.
- 2.6        Drawings for supporting structures including the design calculations.
- 3.0        Copies of test certificates.
- 4.0        Copies of operating and maintenance instruction manual.