



# **S & S POWER SWITCHGEAR EQUIPMENT LIMITED**

## **UNLOADING, STORAGE, ERECTION, INSTALLATION & MAINTENANCE MANUAL**



**CENTRE BREAK DISCONNECTOR  
(TYPE: RC245kV)**



Disconnectors are remarkable pieces of equipment. They can stay in the same position for years before they have to switch. But, then at the critical movement they have to work perfectly. No matter what the conditions are, whether they are in the freezing cold or in the extreme heat.

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## **1.0. PREAMBLE:**

This manual pertains to centre break disconnectors of voltage rating 245kV. The disconnector described in this publication is designed, manufactured and tested with care and will give satisfactory service if it is installed, operated and maintained in accordance with the instructions, by fully skilled personnel duly authorized to carry out this work.

Efforts are constantly being made to improve design and manufacturing. Hence the equipment supplied may differ in minor detail from the data given in this publication.

## **2.0 GENERAL DESCRIPTION OF THE DISCONNECTOR:**

- Disconnectors are primarily off-load mechanical switching device used to isolate equipments and lines in electrical network. They are able to make or break the magnetizing current and line charging current of 0.7Amps at 0.15 power factors.
- Centre Break Disconnectors are designed for independent single pole operation or three pole electrically / mechanically ganged operation. Disconnectors can be supplied with or without earth switches. Where earth switch is required, single or double earth switch can be provided. Disconnector and earth switches can be operated either manually or by motor.
- Centre Break Disconnectors are checked for satisfactory operation at the works. They are supplied in knock down condition ready for assembly at site.
- The relevant standards for Disconnectors are IEC: 62271-102 and 62271-1(Supersedes IEC: 60694) and IS: 9921 and for insulators IEC: 60273 and 60168 and IS: 2544.

## SECTION-A

### UNLOADING AND STROAGE INSTRUCTIONS

#### 3.0 UNLOADING:

- Unload the crates / boxes using crane / fork lift truck, as appropriate.
- **Do not roll the crates. Do not drop the crates over tyres / rubber mats. Etc.**
- Use proper lifting tools / tackles like nylon belts / ropes etc.
- Count the number of crates / boxes and tally them against the shipping document.
- Inspect thoroughly all the crates / boxes for damages.
- In case of damage, identify the crate / box and keep it separately.
- Take adequate photos of the damage.
- Kindly report the damage to the transporter in writing.
- Also mail the damage report (along with the photographs) to the contracts manager of **S&S Power Switchgear Equipment Limited**. Email: [cir@ssppower.com](mailto:cir@ssppower.com) and [sales@ssppower.com](mailto:sales@ssppower.com).

#### 3.1 STORAGE:

**“Failure to properly store and protect disconnectors / parts may cause damage to equipment. Such damage could cause hard operation, mal-operation and contact resistance issue when equipment is installed / tested and mal-function in service.”**

- Storage shall be made in an area that is well ventilated and provided with drains to prevent water stagnation.
- It is advisable to leave all crates / boxes in packed condition until the start of erection.
- All crates / boxes shall be properly stored / stacked with proper covers.
- Disconnector and operating mechanism crates / boxes should always be stored in elevated position (at least two feet above ground) to prevent water entry.
- In case of longer storage period / damp atmosphere, the operating mechanism boxes shall be removed from packing and electrical space heating is to be provided.
- Space heating should continue till complete removal of moisture / condensation.
- Adequate care to be taken to prevent entry / ingress of dirt, moisture, cement, sand and other corrosive material.

### 3.2 LONG TERM STORAGE INSTRUCTIONS:

#### **General instruction (for all materials):**

##### **Ground clearance:**

All materials, including operating mechanisms, should be kept at a minimum of 600 mm (two feet) height from the ground level using pallets or cement concrete bed, to avoid water entry during rainy season. However, the water level rise at the respective site / storage locations shall be considered for fixing the ground clearance (but shall not be less than 600 mm).

##### **Operating mechanisms:**

**The primary consideration in case of long term storage of operating mechanism is the temperature and relative humidity level of the storage location. This should be maintained as closely as possible to the standard reference atmospheric conditions.**

Upon unloading from the container / truck, kindly follow the steps specified below, to ensure proper storage and preservation of operating mechanisms, for long term storage:

##### **During normal seasons (without rain / snow):**

- Take out the operating mechanisms from the wooden cases.
- Remove the polythene cover / bubble wrap sheet carefully.
- Check the operating mechanisms visually for any damages.
- Clean all the outer surfaces.
- Open the door and remove the desiccants (silica gel pack) fitted inside the box.
- Place five fresh bag indicator type desiccant packs (each 100 grams) of fresh silica gel granules (preservatives).
- Close the door.
- Do not cover or wrap the operating mechanism (so that better breathing is provided during long term storage).
- In case of longer periods of storage, replace the silica gel once in 3 months and close the door. (Note: the three month period is indicative only. Kindly check with the supplier of silica gel for time period of usage and time after when it has to be replaced).
- Ensure that the silica gels used are the fresh ones removed from the air tight container (before placing them inside the operating mechanism boxes).
- Keep all the drive mechanisms in a dust free environment.
- If dust is unavoidable then ensure complete cleaning at least once in a month.
- In addition carry out periodical checks for any abnormal dust accumulation and clean accordingly.
- Ensure that the entire storage area is temperature controlled (to ensure better storage and condition of the equipment).

- The optimum temperature is 20 deg c and relative humidity is 45% (values to be checked using combined humidity and temperature indicators placed throughout the warehouse / storage area and should be visible for close monitoring).

**During monsoon seasons (with rain / snow):**

- All points given above shall be followed.
- In addition, during rainy season, anti condensation heaters to be kept “on” and suitable electrical protection to trip the electrical circuit to be provided in case of any short circuit.
- Foam adhesive backed strip with volatile corrosion inhibitors also to be paste along the inner surfaces of the operating mechanism in place of silica gels.
- Inspect all operating mechanism boxes for integrity of the painted surfaces once in a month.

**Other contacts and steel materials:**

- Clean all the contact surfaces thoroughly with a lint-free cloth.
- Protect all contact surfaces with a thin layer of petroleum gel.
- Cover all contacts and Aluminium arms with polythene sheets / covers.
- Ensure that the inside surfaces of the polythene coverings are pasted with foam based adhesive strip.
- Provide volatile corrosion inhibitors sheets and paste them along the inner surfaces.
- Kindly repeat the above steps once in every three months.

**Galvanized steel items:**

These are to be wrapped / covered with waterproof / dust proof covering and sufficient bags of silica gels to be placed in various places inside the covering. Once in 3 months all materials to be cleaned and replaced with silica gel bags.



## **SECTION – B**

### **CONSTRUCTION**

#### **4.0. SCOPE OF SUPPLY**

The Disconnecter and Earth Switch consists of the following main components

##### **Disconnecter**

- Base Assembly Drive End and Non Drive End
- Male Blade Assembly
- Female Blade Assembly
- Tandem Pipe (Phase to Phase coupling pipes) in case of three pole arrangement
- Down Operating Pipe
- Operating Drive Mechanisms
- Support Insulators (Optional)
- Support Structure (Optional)
- Terminal Connector (Optional)

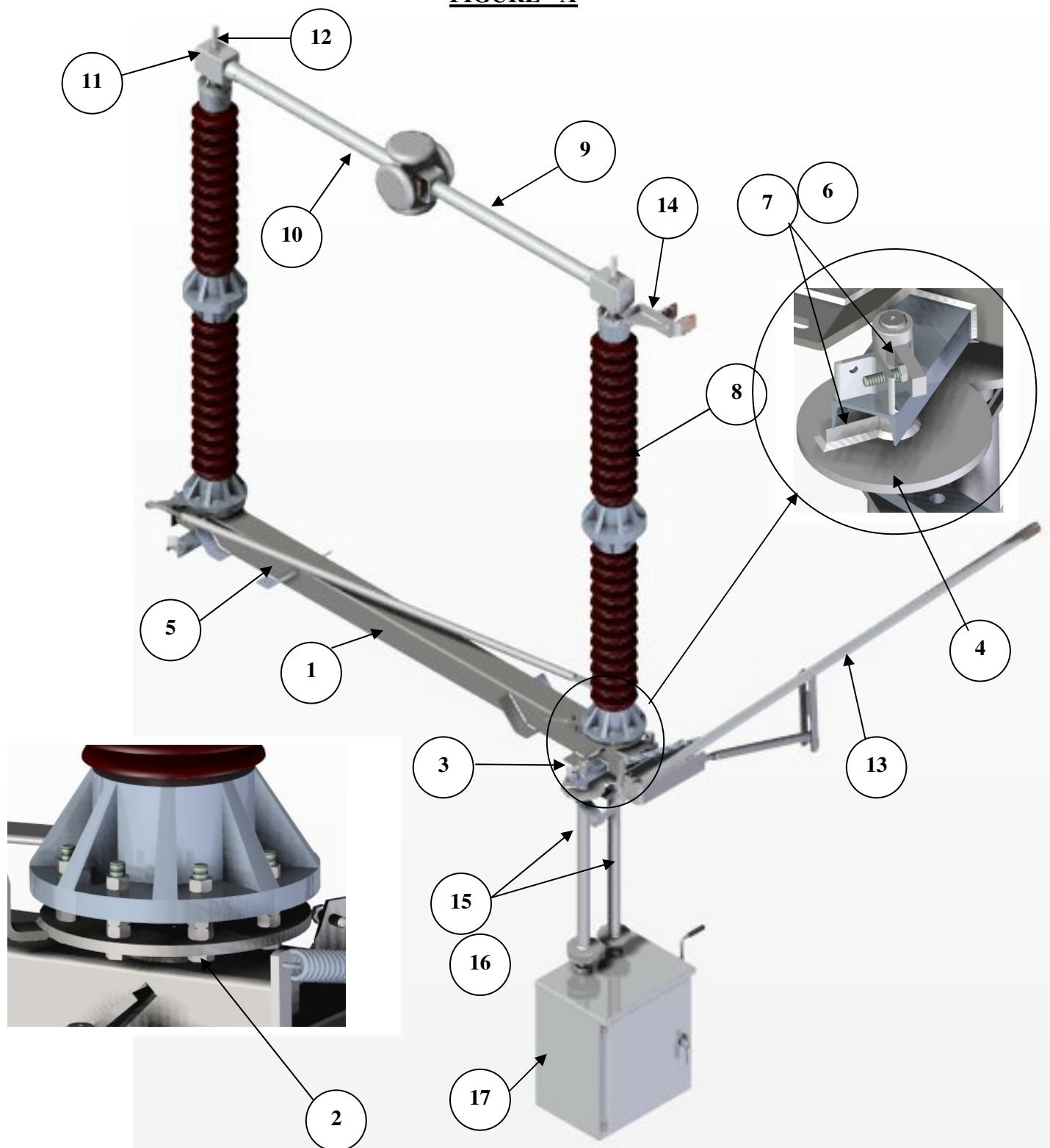
##### **Earth Switch (Optional)**

- Earth Blade with flexible connector
- Earth Fixed Contact
- Tandem Pipe (Phase to Phase coupling pipes) in case of three pole arrangement
- Down Operating Pipe
- Drive Mechanisms

#### **5.0. BASE ASSEMBLY:**

- Each 3 pole disconnector (R, Y, B) is supplied with two types of base assemblies.
  - a) One base Assembly (say R pole) with drive arrangement and interlock arrangement (if the switch is with earth).
  - b) Other two bases (i.e. Y&B) without drive arrangement.
- The base consists of a hot-dip-galvanized steel channel (1) (**See figure. A**).
- Bearing shaft are assembled in bearing housing made out of steel tube (2).
- All ferrous parts in base assembly are hot-dip galvanized to IS 4759-1984.
- Base assemblies are supplied with:
  - a) Bearing shafts are assembled and aligned condition.
  - b) Torque bearing (Drive arrangement) for Main and Earth in assembled condition (only for drive end).
  - c) Inter locks arrangement in pre-set condition (4).
  - d) Lever and hinges with pins, friction washer, Brass washers and split pins.
  - e) Four legs with slots (5) for fixing the base channel to the supporting structure.
  - f) The mechanical limit stop of the disconnector in “closed” position (6) and another limit stop in “open” position (7) for disconnectors.
  - g) Two rotating support (8) insulators

**FIGURE - A**



Sl.	Item Description	Qty / Switch	Remarks
1	Base – Drive End	1	Galvanized Steel Channel Section having provision for bearing shaft, Drive coupling arrangement for main/earth.
	Base – Non drive end	2	
2	Leveling bolts	48	Bolts for alignment of insulator
3	Interlock Assembly	1	Provided in case of Disconnector with single/double earth. Galvanized steel Items.
4	Inter locks	1	Inter locks arrangement in pre-set condition
5	Base fixing legs with slots	4 per base	For fixing the base channel to the supporting structure.
6 & 7	Mechanical limit stop	2	The mechanical limit stop of the disconnector in “closed” position and another limit stop in “open” position for disconnectors
8	Support Insulator	6	Solid core (Optional Item)
9	Male Blade Assembly	3	Aluminum tube welded to Aluminium hinge housing. Silver plated Copper contact bolted at the end of tube. Current transfer through Tinned Copper tube/rod.
10	Female Blade Assembly	3	Aluminum tube welded to Aluminium hinge housing. Silver plated Copper fingers bolted at the end of tube. Current transfer through Tinned Copper tube rod.
11	Hinge housing	6	Aluminium hinge consisting of transfer contact assembly.
12	Connector Stem Terminals	6	Tinned Copper tube/rod.
13	Earth switch	WOE – 0 WSE – 3 WDE – 6	Aluminum tube fitted with Silver plated Copper special section at one end and tin plated Copper flexible for grounding/earthing.
14	Earth Fixed Contact	WOE – 0 WSE – 3 WDE – 6	Silver plated Copper fingers fitted to an Aluminium casting
15 & 16	DOP – Main DOP – Earth	WOE – 1 WSE – 2 WDE – 3	Galvanized Steel Pipe.
17	Operating Drive – Main & Earth	WOE – 1 ** WSE – 1 ** WDE – 2 **	Motor operated or Manual with provision for Gear box and Electrical items.

**Note:**

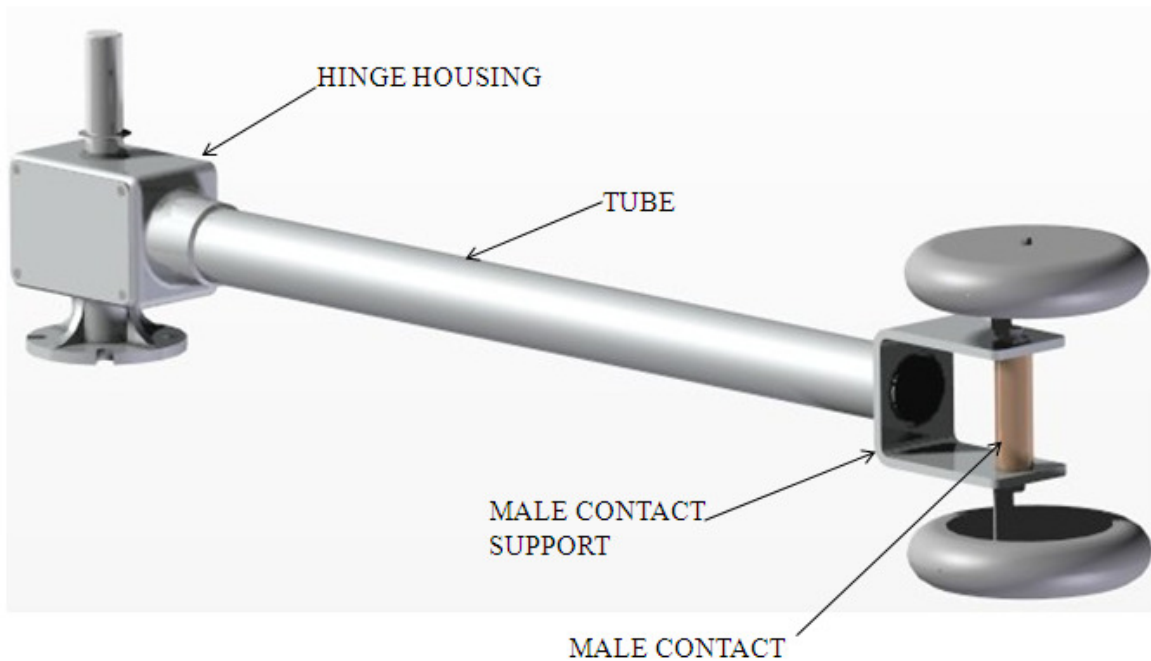
- WOE – Without Earth
- WSE – With Single Earth
- WDE – With Double Earth

**\*\* - Drive box quantities are pertaining to mechanically ganged 3 pole disconnectors.**

## 6.0. MALE BLADE ASSEMBLY:

- The current carrying male blade is made of Aluminium / Copper tube. (See figure. B).
- At the end of the tube, male contact is bolted which is made of electrolytic copper with silver plating on contact side and tin plating in fixing side (with Aluminium / Copper Tube). Depending on the current rating the size of the contact may vary.
- The terminal connector stem is mounted inside the hinge housing, provided in the end of the moving blade. The hinge housing supports the blade.

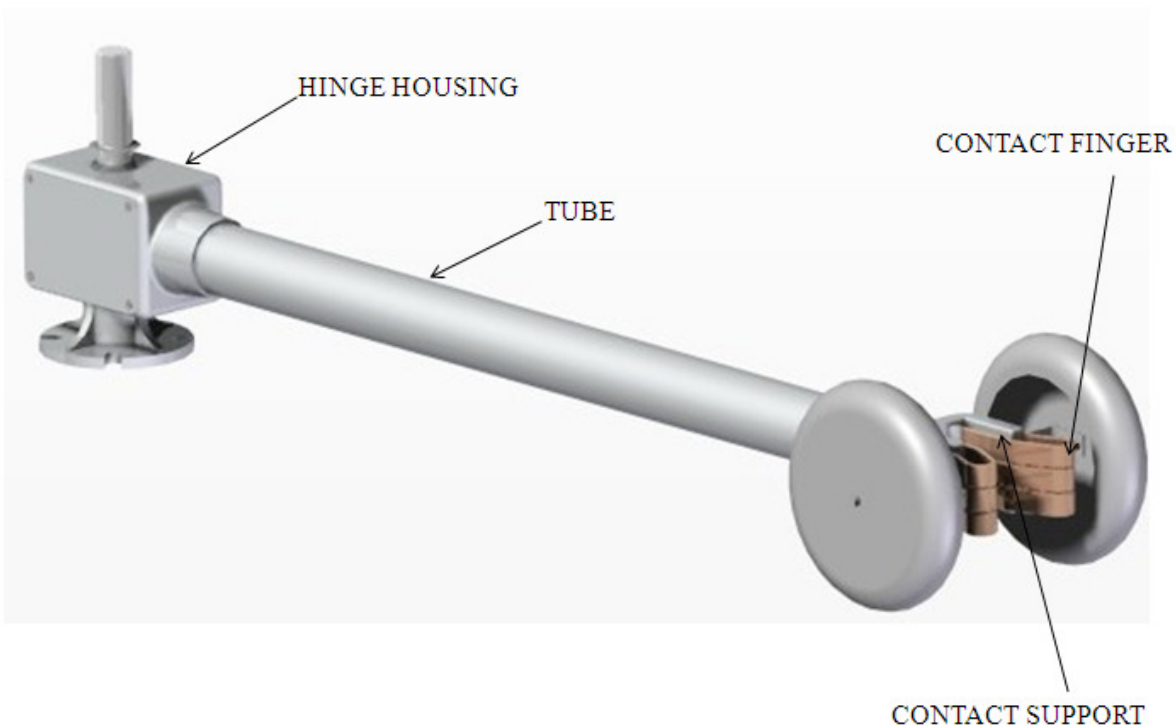
**FIGURE – B**



## 7.0. FEMALE BLADE ASSEMBLY:

- The current carrying Female blade is made of Aluminium / Copper tube. (See figure. C).
- At the end of the tube, Female contacts are bolted which is made of electrolytic copper with silver plating on contact side and tin plating in fixing side (with Aluminium / Copper Tube). Depending on the current rating the size and number of the contacts may vary.
- Electrolytic corrosion between the fingers and Aluminium alloy is inhibited by doing tin plating at the bottom side (The size and number of contacts surface with Aluminium casting) of finger and also application of electrical jointing compound during assembly.

**FIGURE – C**



#### **8.0. TANDEM PIPE(MAIN & EARTH):**

- The tandem pipe assembly is used to connect adjacent poles for gang operation of all the three poles with one drive mechanism. The lengths are adjustable to suit minor variation at site. **(See figure. F)**
- These parts are hot-dip galvanized and assembled with necessary pins & bushes etc.

#### **9.0. DOWN OPERATING PIPE(MAIN & EARTH):**

- This assembly is used to connect the 'T' bar torque bearing assembly fitted in base assembly to the flange fitted in operating mechanism box assembly.  
**(See figure. E).**
- The above assemblies are made out of MS Pipe with 'T' bar welded in topside and vernier Flange welded at the bottom according to structure height.
- The above welded assembly is hot dip galvanized.
- Depending on customer requirement universal joints can be provided as follows.
  - a) Two universal joints (1), one with 'T' bar (2) and other on the vernier flange (3) of the drive mechanism.
  - b) One universal joint at the bottom and diaphragm plate (4) on the top.

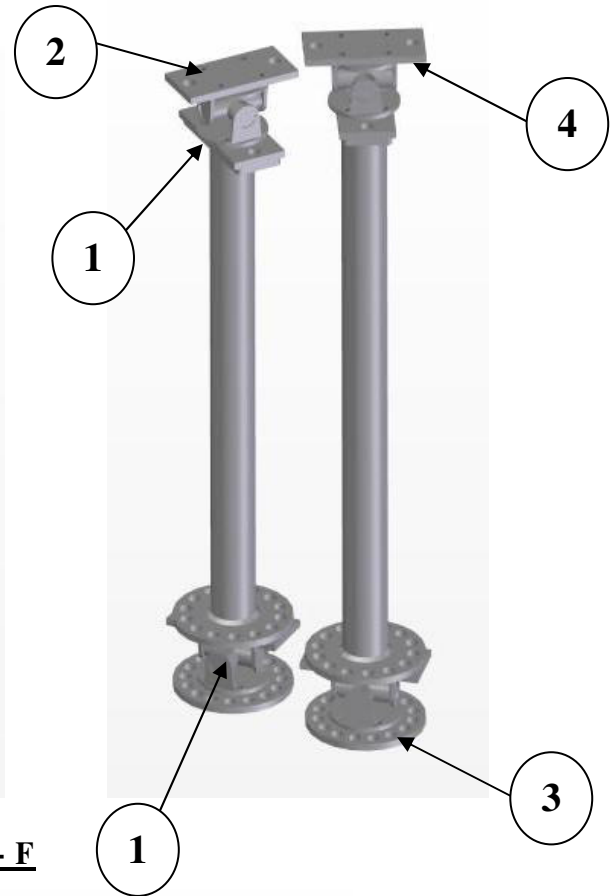
#### **10.0. OPERATING DRIVE MECHANISM:**

- Geared motor operating mechanism consists of a final worm reduction gear driven by a DC or 3Ø AC motor in line with customer requirements.
- Necessary overload protection, control switches for Local / Manual / Remote operation and limit switches for control / signal are provided. In the event of supply failure, the mechanism can be operated manually. Manual operating mechanisms are supplied with or without reduction gear in accordance with customer requirements.
- The mechanisms are housed in an IP55 grade box made of Aluminium / Mild steel / Stainless steel having a thickness of 2-3mm. Auxiliary switches having silver-plated contacts with positive wiping action with adequate number of NO, NC and long wipe contacts as per specific requirements are provided. Suitable blank gland plate is provided at the bottom for cable terminal gland.
- Suitable terminal blocks made of non-inflammable thermosetting plastic are provided for terminating control and auxiliary wiring. Front door of the mechanism box is provided with good quality gasket to ensure high degree of protection against polluted atmosphere. **(See figure. D)**

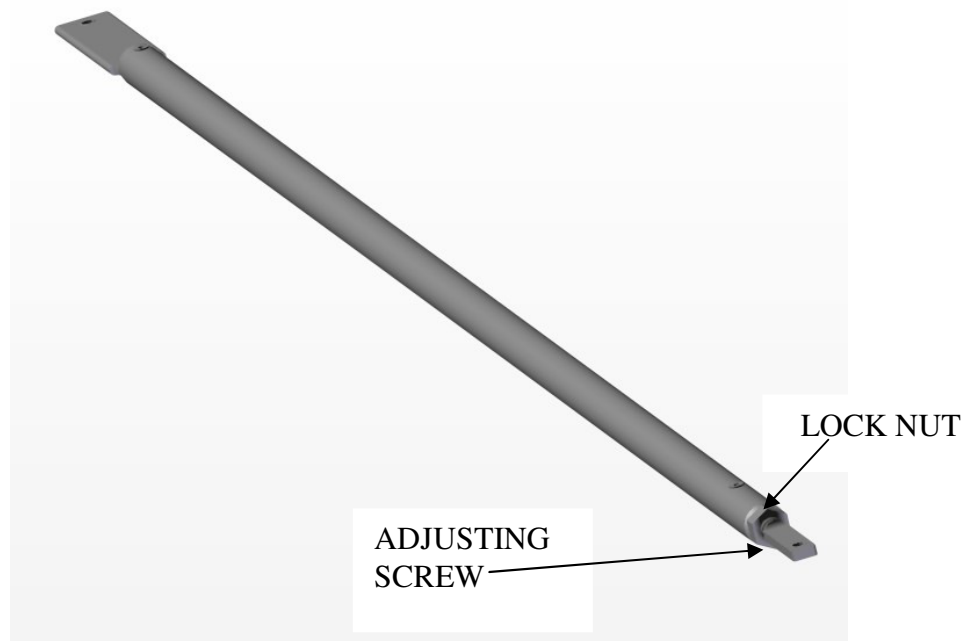
**FIGURE – D**  
**OPERATING MECHANISM**



**FIGURE – E**  
**DOWN OPERATING PIPE**



**FIGURE - F**



**TANDEM/GANG PIPE**

## 11.0. INSULATOR ASSEMBLY:

- Insulators (8) are selected to meet the basic insulation level, minimum creepage and minimum bending load to suit the Customer / Design requirement. (See figure. A).

## 12.0. EARTH SWITCH ASSEMBLY. TYPE- FREE ENTRY (FEE):

- Free entry earth switch is operated through levers (1) and has over center provision in base to prevent the switch from opening due to wind forces, vibrations or any short circuit force. (See figure. G)
- Moving blade made out of Aluminium tube (2).
- Extrusion contacts (3) made out of electrolytic copper with silver plating are fixed to the end of the tube.
- Mounting plate and all other parts are hot-dip galvanized and supplied in assembled condition.
- The lower end of the tube is provided with flexible Tinned Copper connector (4) (number and size vary according to the short-circuit withstand capability) for the connection to the earthing switch base.

**FIGURE – G**  
**EARTH SWITCH**





### 13.0. SUPPORT STRUCTURE:

- Support structure, when ordered, shall be designed and manufactured to meet customer specifications.
- They are assembled on the civil foundations of the customer and shall meet the dimensions of the Disconnectors / Earth Switch with their respective drives etc.
- Structures are hot dip galvanized to meet IS4759 – 1984 Specifications.
- Structures are designed with necessary factor of safety to withstand all forces i.e., short circuit force, wind force and dead load etc.

#### SUPPORT STRUCTURE



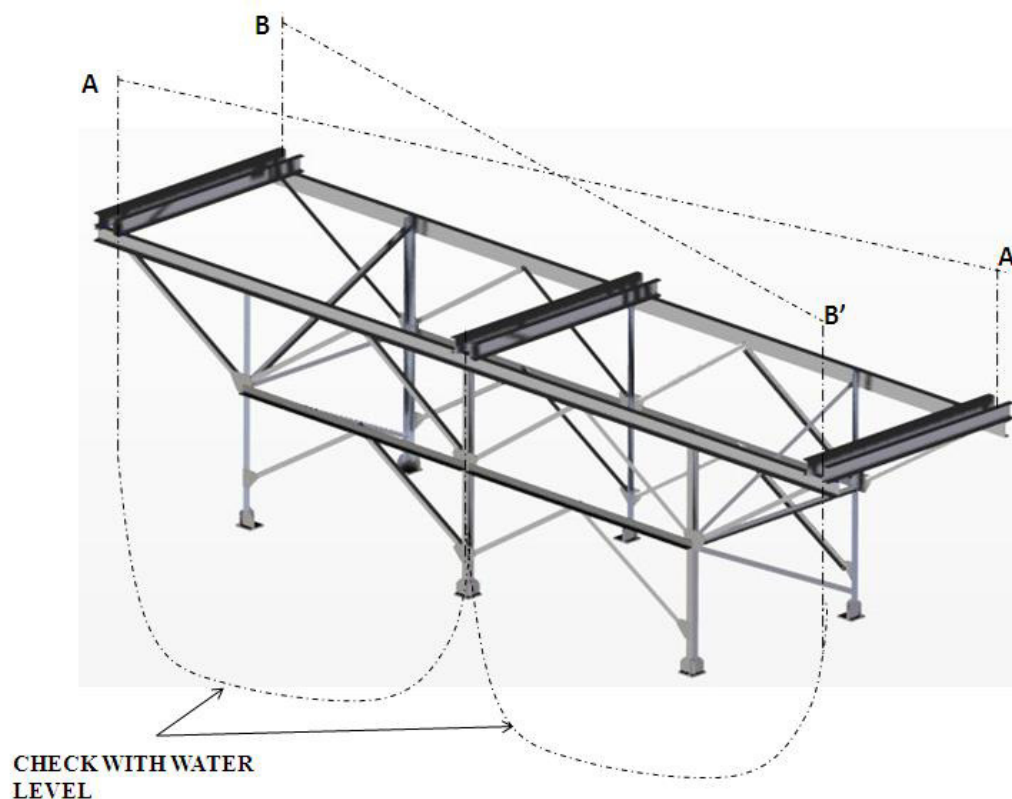
## SECTION-C

### INSTALLATION & SETTING INSTRUCTION

#### 14.0. ERECTION SEQUENCE:

- Structure
- Bases
- Insulators
- Hampers
- Earth switch
- Earth Fixed Contact
- Drive Box – Main and earth
- Down Operating pipe
- Tandem pipe Main and earth.
- Terminal connectors

#### 15.0. STRUCTURE: (WHERE SCOPE IS INCLUDED)



Before start of erection of Structure ensure the following

- Keep Approved General Arrangement drawing of structure.
  - Check & ascertain the position of Drive fixing end.
  - Ensure plinth with proper grouting of foundation bolts.
- Ensure phase to phase distance is as per approved General Arrangement drawing

**Erection of Structure** (Given below is only indicative and can vary depending upon the structure design adapted by Customer/Contractor.

- Refer the site layout and identify the structures of the respective disconnector to meet the sub-station lay-out.
- Place the leg members in respective position on the plinth and tighten the nut by hand.
- Fix the cross members.
- Check the leg members with plumb; if required, give shims at the bottom of the structure.
- Check the 3 pole structure with water level tube from one end to the other end and give shims, if required, to get perfect water level.
- Check for levels at the top of the Structure in the both directions by using spirit level / Water levels. If required give shims below the base plate of structure and tighten the nuts.
- Keeps the base fixing channel on top of the structure member.
- Check with sprit level on two directions as shown in the fig and, give shims, if required.
- Similarly complete erection of all structures.
- After erection, check for the following:
  - a) All fixing dimensions with respect to the centre of the structure.
  - b) Diagonal distance to match as per contract drawing.

**FIGURE - H**



**LIFTING OF BASE ASSEMBLY**

**FIGURE - I**



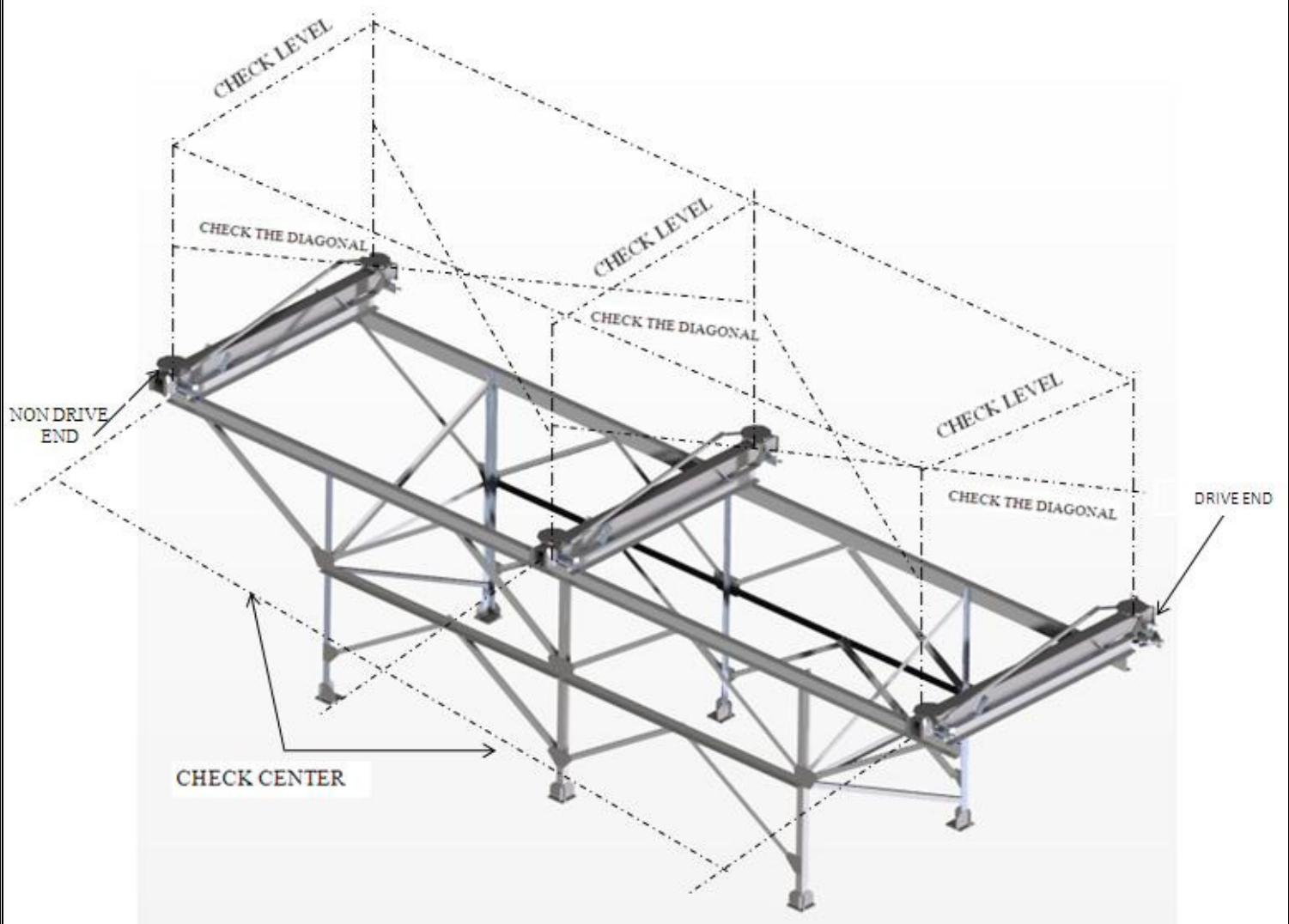
**16.0. BASE ASSEMBLY:**

- Identify the base drive & non drive end.
- Remove the base fixing hardware from bases and keep it in proper place.
- Lift the base assembly by proper slinging (**See figure. H**) to avoid damage during erection.
- Identify the drive end base and place in the proper position on top of the structure. Fix the hardware; do not tighten fully.
- Place the other two bases on top of the structure in the proper position. Fix the hardware; do not tighten fully.
- Check with spirit level on top of bearing shaft (**See figure. I**) and give shims if required on the leg of the bases.
- Check the diagonal distances.
- Tighten all the bolts. After complete tightening once again check with spirit level.

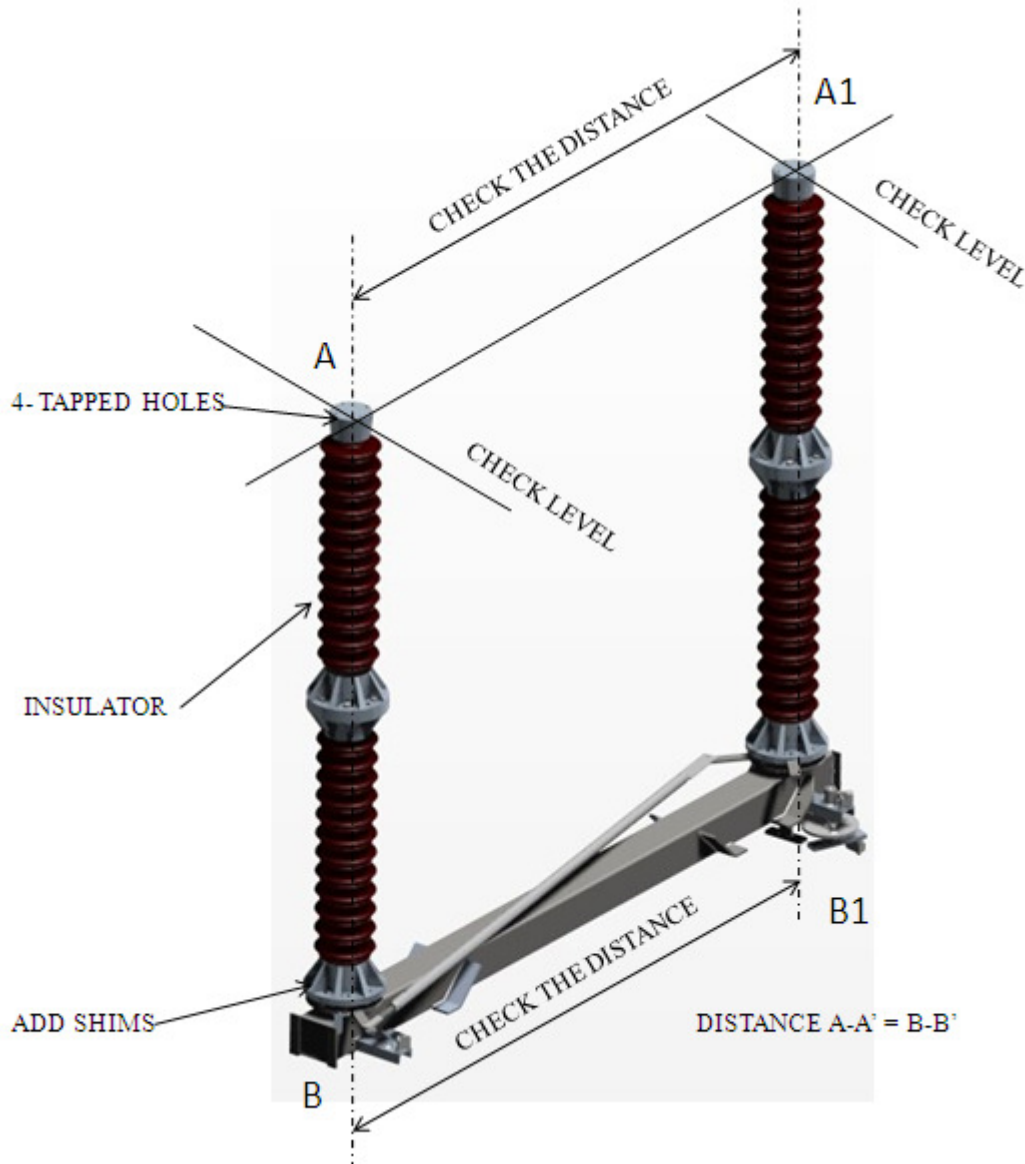
**Note:**

- Ensure the correctness of centre line of same pole and centre line of other phases.

## 17.0. ALIGNMENT AND LEVELLING OF BASE WITH STRUCTURE



## ERECTION OF INSULATOR



### **18.0. Erection of Insulator**

Before Start of erection ensure the following

- Clean the insulators thoroughly.
- Keep the fixing hardware in respective places.
- Identify the Insulator and keep it respective position.

#### **Erection**

- Lift the insulator and keep it over the top flange of the bases and fix the bolts; do not tighten fully.
- Check, spirit level in two directions as shown in the fig and, give shims, if required.
- Check the inter pole dimension as per the drawing and, align as per procedure, if required.
- Tighten the bolts fully.
- Once again check with spirit level in two directions as shown.
- Follow the above procedure on the other two poles.

## LIFTING OF HAMPER



### **19.0. Erection of Hamper**

Before erection ensure the following

- Identify the Male and Female hamper.
- Keep the fixing hardware in respective place..
- Keep the earth fixing adaptor in case of Disconnector with earth.

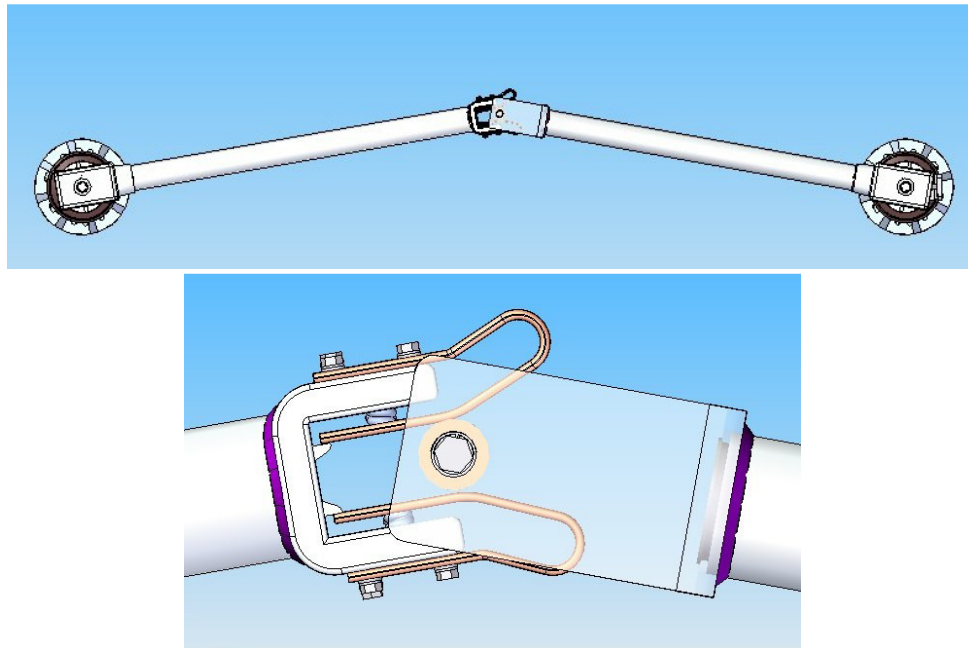
#### **Erection**

- Lift the Male or Female hamper with proper sling as shown in the Fig and position it in the respective place as per the approved General Arrangement drawing. Fix the hardware; do not tighten fully.
- Ensure earth adaptor (in case of Disconnector with earth) (Refer fig) is in the respective side as per the approved drawing.
- As shown in the fig bring the male and female hamper to close position and check free entry of Male contact into the female contact.
- Check the male contact position with respect to fingers (refer fig); if required, align either male blade or female blade with shims.
- Check the above operation at least 5 times and ensure free entry of each blade.
- Repeat the above procedure on the other two poles.

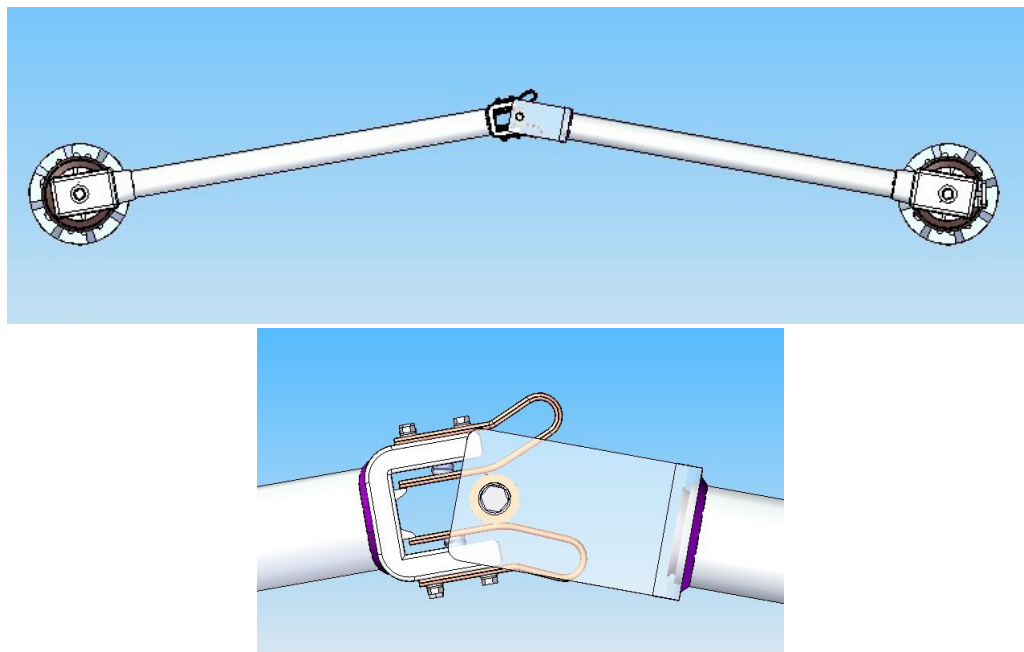


**FIGURE- L**

**1. FEMALE HAMPER CLOSING FORWARD**

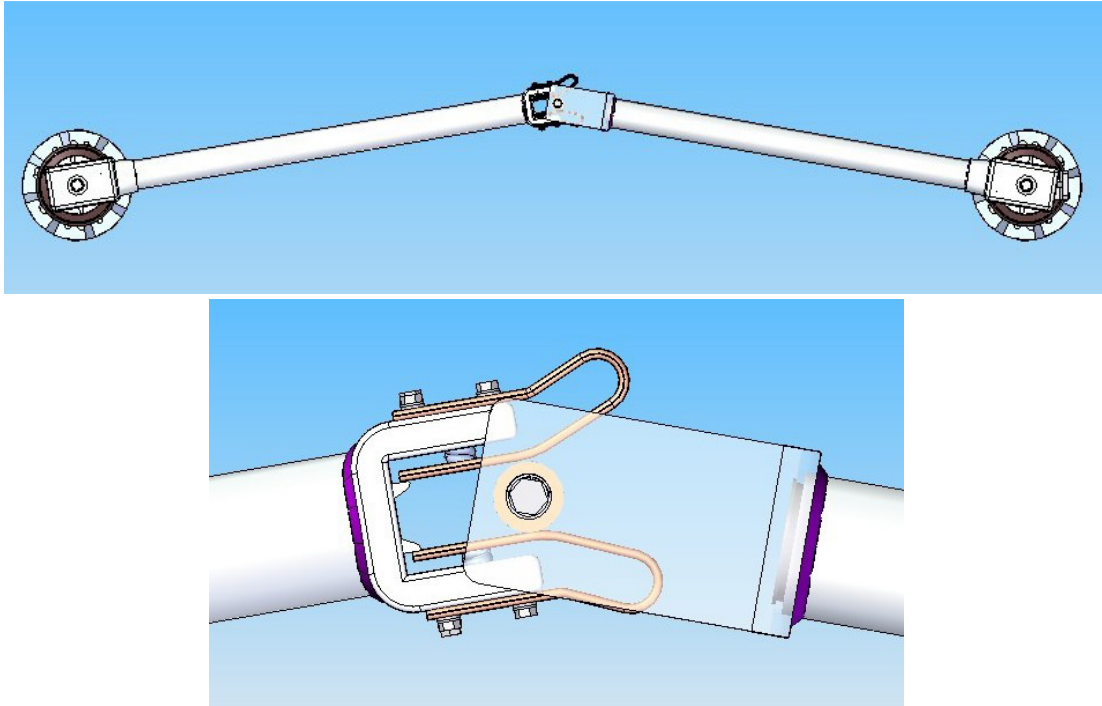


**2. MALE HAMPER CLOSING FORWARD**

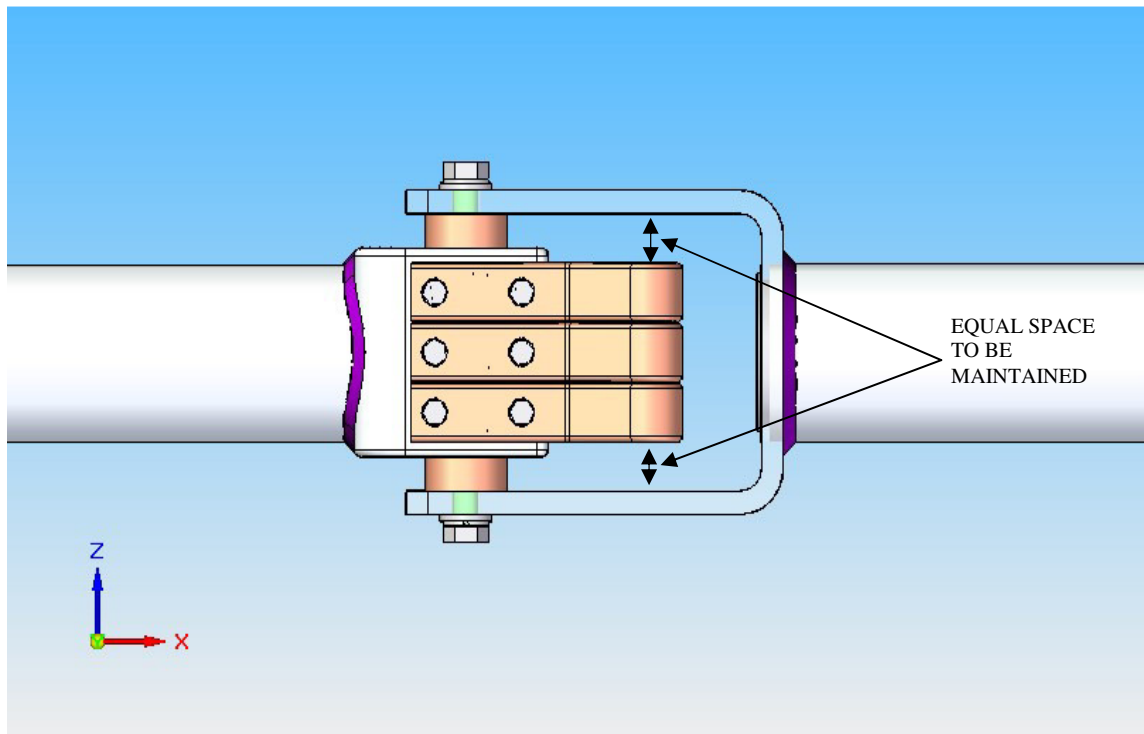




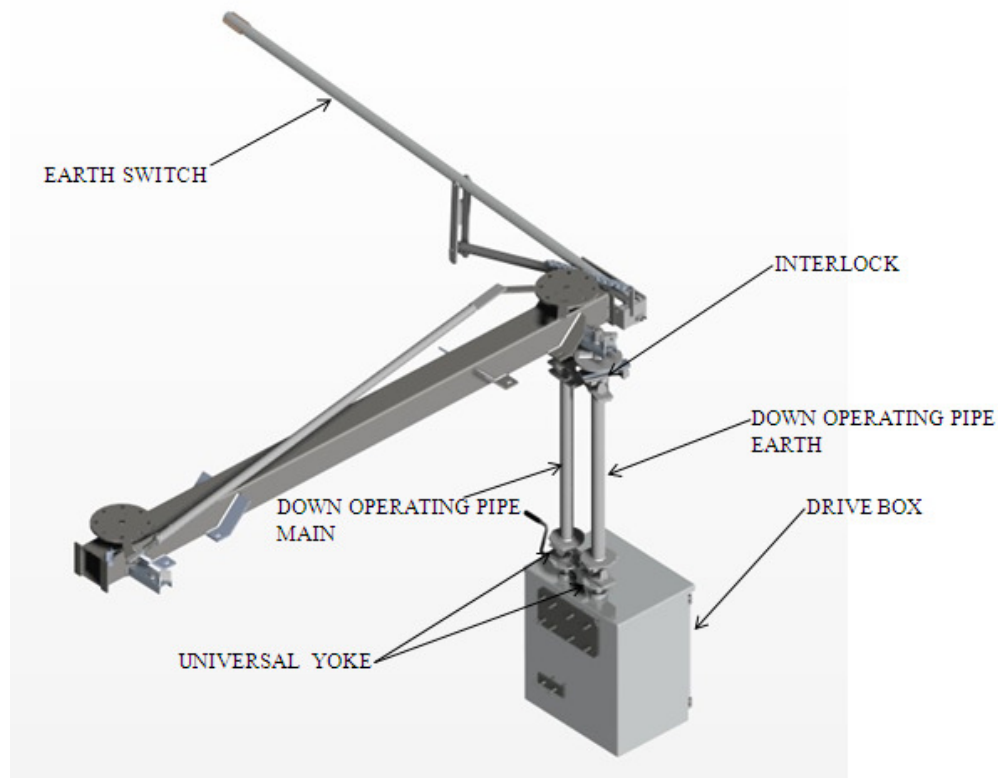
### 3. BOTH MALE AND FEMALE HAMPER ARE UNIFORM2



### 4. ALIGNMENT OF MALE AND FEMALE CONTACT



## 20.0. ERECTION OF DRIVE BOX



**FIGURE- M**

Identify the mechanism box with the help of drawing and packing list and open the case carefully.

### **MOUNTING:**

Do not attempt to lift mechanism by drive coupling flange. Use slings or forklift at base of cubicle. Lift mechanism box into position and fix with structure. At this stage fixing bolts should only be hand tightened.

### **CONNECTING DISCONNECTOR:**

- Check for centre line and vertical line between torque bearing flange and drive flange with a plumb.
- Fix the tee bar end of the down operating pipe to the universal yoke and fix the assembly to the provision available on the drive end base (**See figure. M**).
- Now fix the other end of down operating pipe to the universal yoke and fix the assembly to drive box flange using the principle of vernier hole alignment (Only two holes will be aligned).
- Tighten all bolts.
- Operate the pole manually and ensure open/close label is in proper position.

## **ADJUSTMENT:**

### **A. MANUAL**

By using emergency handle, operate the coupled disconnecter and observe whether it is OPENS or CLOSES fully at each end of its operating cycle. (Ensure minimum 10mm gap between pad lock brackets.) If the disconnecter does not CLOSE fully remove clamping bolts which is bolted on the operating mechanism flange and turn mechanism slightly towards OPEN and re-tighten the bolts with the help of the Vernier holes provided.

Proceed with disconnecter closing. Repeat until satisfactory operation is obtained.

### **B. ELECTRICAL**

Make electrical connections strictly according to the contract diagram of connections of incoming supply. Do not attempt to operate the Disconnecter under power at this stage.

When selector switch is fitted, set it to LOCAL.

When Motor is fitted, manually set Mechanism to mid Position and: -

- Operate Control Switch and at the same time observe whether the mechanism rotates towards the selected position.
- If it rotates in opposite direction to that selected, stop motor immediately, by switching off power supply using Emergency push button switch.
- Reverse the connection of motor supply.

## **ELECTRICAL OPERATING EQUIPMENT:**

A hinged panel on the left hand or right hand side of the cabinet carries the electrical control, for operation of the mechanism, which is accessible immediately after the cabinet outer door is opened.

### **PANEL DOOR COMPONENTS:**

#### **LOCAL / REMOTE / MANUAL SELECTOR SWITCH**

This selector switch is provided to select the position according to the requirement. When the selector switch is set to local, operation of the mechanism will be governed by the controls in the cabinet. Setting the selector switch to remote transfers controls of the mechanism to remote control point.

#### **OPEN AND CLOSE SWITCH**

In case of individual pole drives, the master control cabinet will have push buttons / selector switch for opening / closing also. The control switch determines the direction of travel of the disconnecter. When a cycle is initiated by switching to the appropriate position, the disconnecter will open or close. Once the mechanism receives a signal from the push button/ selector switch, the mechanism will commence the operation and will not respond to further signals until it has completed its operation. An indicator is provided outside the top sheet of the cabinet (below the output shaft) to show the disconnecter is OPEN or CLOSE.

### **HEATER AND THERMOSTAT (OPTIONAL)**

An anti-condensation heater is fitted in the cabinet. A switch is mounted on the front of the control panel for the control of the heater through a thermostat. It should be switched on as and when required to ensure that appropriate temperature inside the cabinet is maintained. The heated air leaves the cabinet by way of a breather.

## **OPEN AND CLOSE CONTACTORS**

These contactors are mounted in the rear of the panel door. They directly control the reversing operation of the motor. Further contacts are used for electrically interlocking the contactors, providing circuit across the 'OPEN' and 'CLOSE' Push Buttons / Cam Switch.

## **AUXILIARY SWITCHES**

Auxiliary switch are mounted in the rear side of the cabinet connected to gear shaft through cam and operating lever. It consist of silver plated contacts with a positive wiping action, which provides low current signal to the control circuit.

## **TERMINAL BLOCKS**

Terminal Blocks are designed for use with 1.5 / 2.5 Sqmm cable. Rated Miniature circuit Breaker / Fuse is mounted in the panel door. The current ratings of Fuse/MCB - links are shown on the schematic diagram.

## **FOR CLOSING THE DISCONNECTOR**

Set the selector switch to local execution as required and then operate the cam switch for closing, there by causing the closing contactor (CC) to pick up. The hold on contact of closing contactor (CC) will now be closed there by retaining the supply after the cam switch is released.

After completion of closing cycle, when the disconnecter operate for opening, the opening contactor (OC) will pickup. The hold on contact of opening contactor (OC) will now be closed there by retaining the supply after the cam switch is released. Ensure motor direction is towards closing. Otherwise change the phase sequence of motor in terminal box. The disconnecter will start to close. At the end of the closing operation limit switch for closing (LSC) will open, de-energizing the closing contactor (CC). The circuit is now de-energized and the closing operation is completed.

Kindly note, to prevent malfunction, contact (CC) of the closing contactor will isolate the opening circuit, once contactor (CC) is energized.

## **FOR OPENING THE DISCONNECTOR**

A Similar sequence of operation will be executed by operating the cam switch in the other direction.

## **OPERATION OF BOLT COIL (MOTOR / MANUAL)**

### **CONDITION – 1**

#### **MAIN DISCONNECTOR CLOSED AND EARTH SWITCH OPEN**

LMR (Local Manual Remote) switch in local or remote position.

- The plunger is in protruded condition (coil de-energized).
- The cap fixed to the plunger blocks the insertion of the manual handle (there by preventing manual operation).
- At this condition there will not be supply to push button switch. (MPB).

**CONDITION -2.****MAIN DISCONNECTOR OPENED**

LMR switch in manual position.

- Now the push button switch (MPB) will get supply.
- When the MPB switch is pressed, the supply will go to bolt coil and pulls the plunger downwards.
- The plunger in turn actuates the limit switch positioned below the plunger, cutting off the supply to the motor.
- The manual operating handle can now be inserted & the gear box can be operated manually.

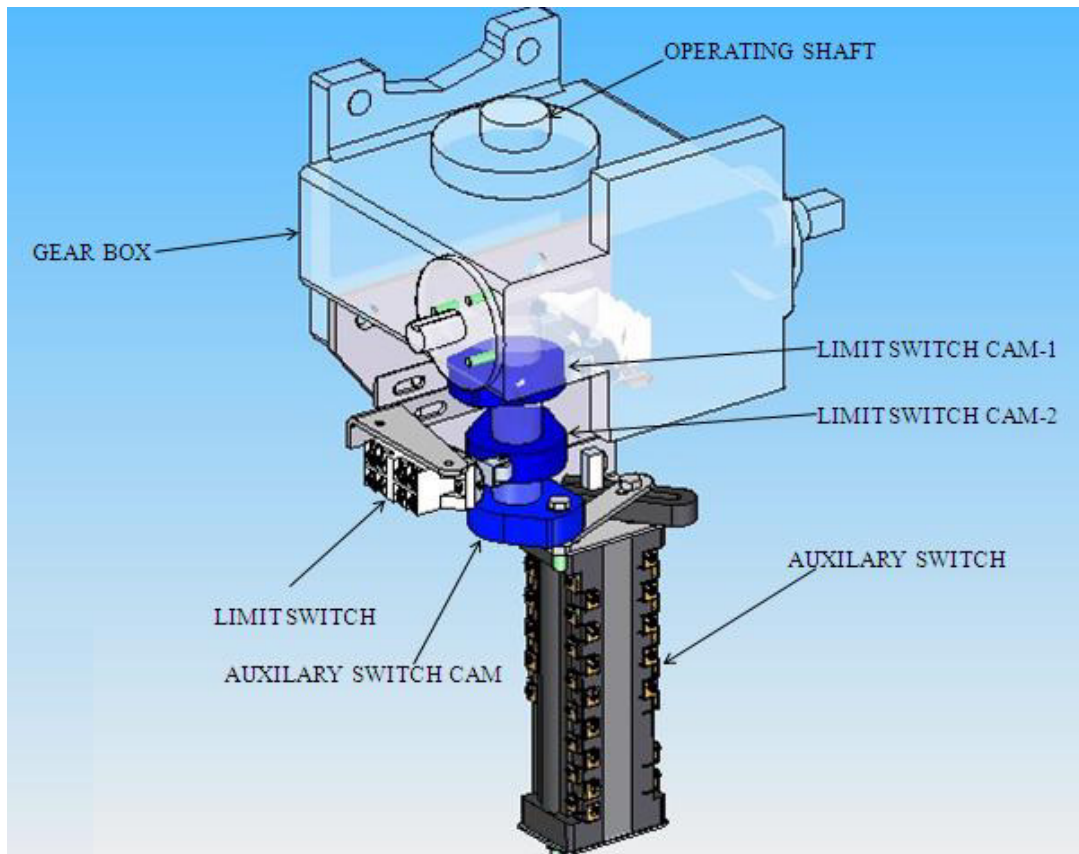
**OPERATION OF BOLT COIL (EARTH)****CONDITION – 1****MAIN DISCONNECTOR CLOSED AND EARTH SWITCH OPEN**

- At this condition the coil plunger will pass through the interlock cam and top guide plate by spring inside the coil (coil de-energized condition).
- The interlock cam is protected from rotation by plunger, which is guided by top and bottom guide plate.
- At this condition there will not be supply to Earth Push Button (EPB) switch.

**CONDITION – 2****MAIN DISCONNECTOR OPENED**

- Once the disconnecter is opened the push button switch (EPB) will get supply.
- When the EPB switch is pressed, it will give the supply to bolt coil and pulls the plunger downwards.
- Now the interlock is free and earth can be operated.

## SETTING OF AUXILIARY SWITCH AND LIMIT SWITCH CAMS



### **OPERATION OF AUXILIARY SWITCH AND SETTING CONSTRUCTION – 1**

- Auxiliary switch is fixed to the rear sheet of the drive box along with bracket.
- A slotted lever is fixed with the drive shaft (square) of auxiliary switch and clamped with bolt and nut.
- A cam is fixed with the main shaft (bottom side extended) of the gearbox below the limit switch cams and locked with screw and nut.
- A link plate is assembled with cam on one side and with auxiliary lever on the other side.

### **OPERATION**

Whenever the main shaft rotates either to close or open, the cam also will rotate and operates the auxiliary switch through the link

### **Note:**

The auxiliary switch settings are done at works. However, in case fine tuning is required then follow the steps given below.

### **SETTING OF AUXILIARY SWITCH**

- Keep the main Disconnector in open / closed condition.
- Keep the auxiliary switch lever in 'NO' position according to scheme.
- Rotate the cam and check the continuity of required contacts in auxiliary switch.
- If required loosen the pin in auxiliary switch slot and move the pin with in the slot either inside or outside and lock it again.
- After this adjustment again operate and check for continuity.
- In the same way other positions also can be set.

### **LIMIT SWITCH OPERATION IN DRIVE MECHANISM CONSTRUCTION-1**

- Limit switch is fixed to a bracket and the entire set is fitted to the rear sheet of the drive box.
- The operating cam is fixed to the main shaft (bottom side extended) of gear box and locked with screw after positioning the cam.

### **OPERATION**

Whenever the main shaft rotates either in close direction or open direction, the cams fitted in the main shaft also will rotate and operates the relevant limit switch.

### **Note:**

The limit switch settings are done at works. However, in case fine tuning is required then follow the steps given below.

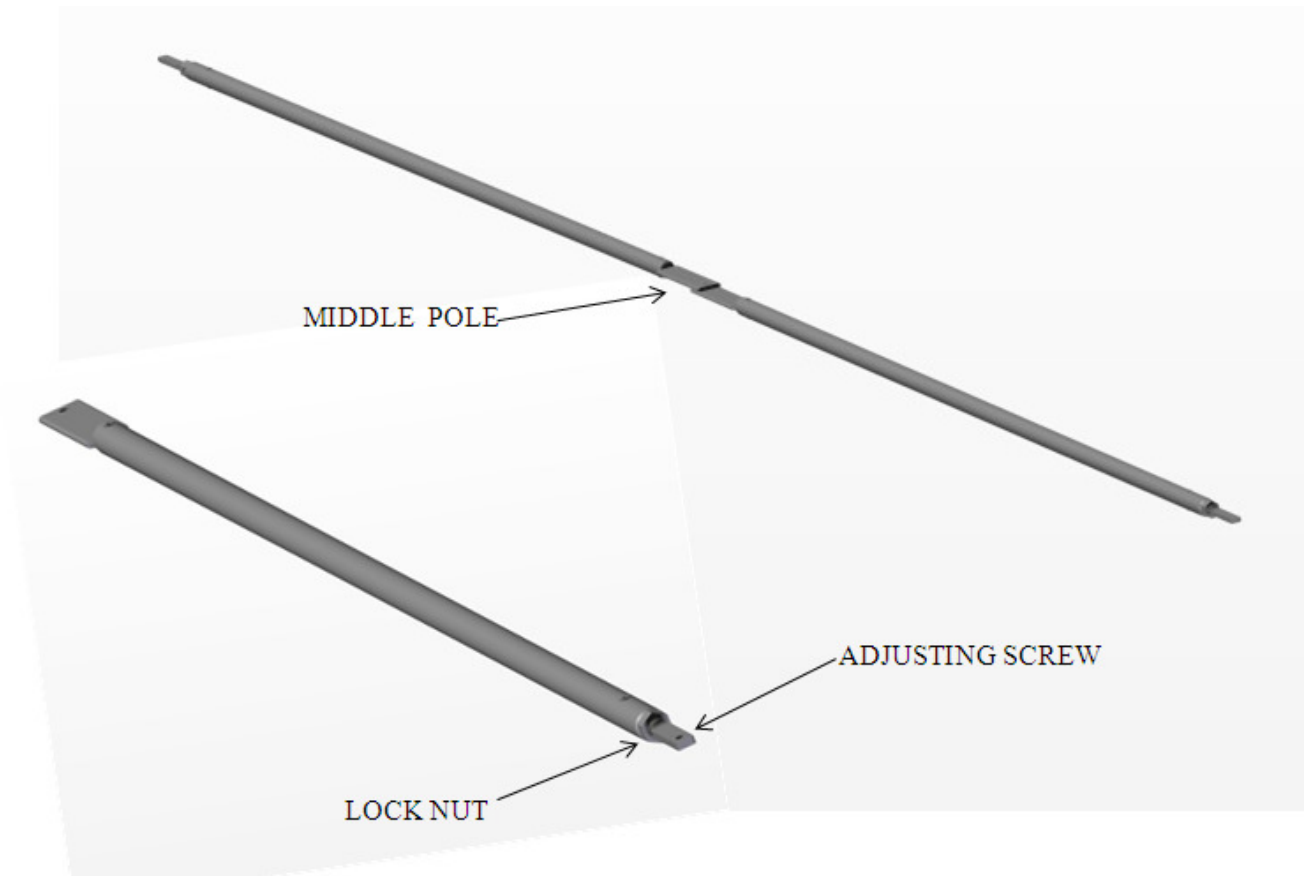
### **SETTING OF LIMIT SWITCH CAM 1 AND CAM 2**

- Operate the disconnector manually to open position.
- Rotate the cam and see that the cam presses the limit switch roller till it disconnects the contact (a click sound will be heard).
- Again close the disconnector manually.
- Now operate the disconnector by motor and see that the operation is completed by the limit switch.
- If small adjustment is required, then, loosen the screw of the limit switch **CAM 1**.
- Rotate the cam either towards the roller or away from the roller, as required.
- Ensure the cam makes contact with the limit switch (for opening).
- Tighten the screw of the limit switch **CAM 1**.
- In the same way another switch (for closing – **CAM 2**) can be set.

### **21.0. ERECTION OF DOWN OPERATING PIPE:**

- Identify the Main and Earth down pipe.
- Keep the Disconnector and Drive box in open position
- 5 nos. packer plates provided for any minor adjustment.
- Fix the tee bar end to the provision available on the Drive end base as shown in the fig.
- Fix the other end to drive box flange using vernier holes.
- Operate the pole manually and ensure open/close label is in proper position.

## TANDEM PIPE:

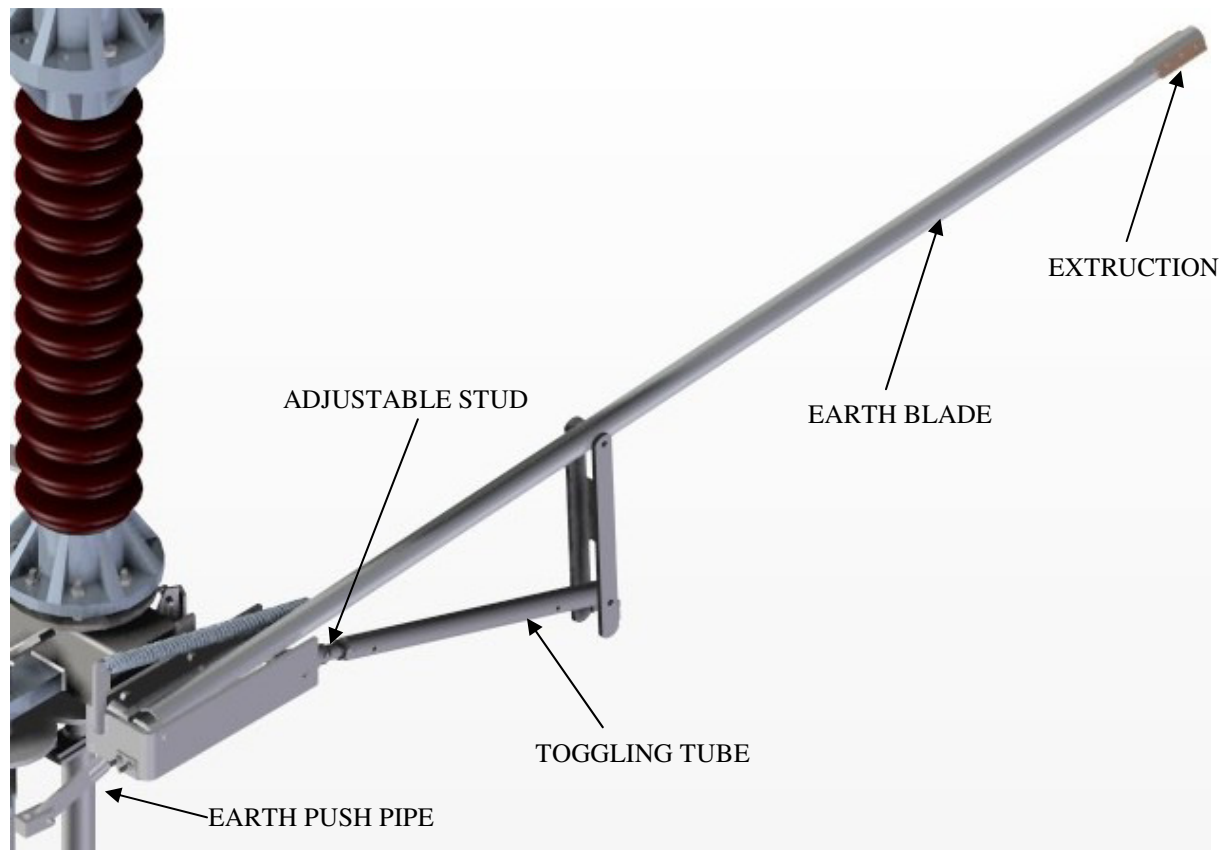


### **22.0. ERECTION OF TANDEM PIPE:**

- Remove the connecting pin from the lever and keep it separately.
- Keep the Drive end Disconnecter in closed position
- Keep the Second pole in closed position. Connect the tandem pipe (Phase coupling pipe). If required extend or shorten by adjusting the screw rod.
- Operate the Disconnecter manually and ensure it opens and closes properly. If not, then adjust the tandem pipe length.
- Ensure all split pins are secured properly.



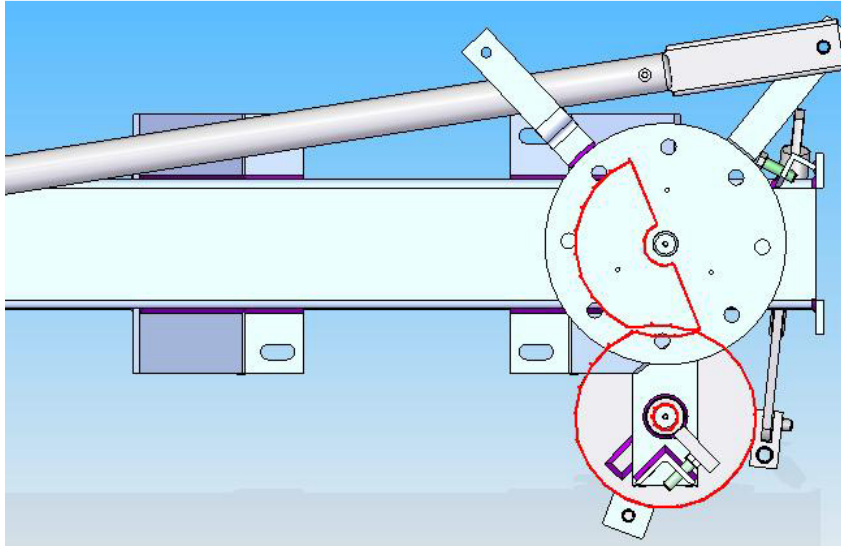
## 23.0. ERECTION OF EARTH SWITCH



- Identify the drive & non-drive earth switch and fixing side of the earth switch by referring to the GA Drawings.
- Lift the earth switch assembly by using rope and fix it with base assembly by using M12 bolts and nuts.
- Operate the Earth Switch by using lever and check for the alignment.
- If the travel is less increase the length of coupling tube by using adjusting stud and align it.
- If the centre line of the moving blade and fixed contact is not straight adjust the moving blade assembly by using necessary shims.
- Tighten all Bolts.
- Repeat the above procedure on the other two poles.

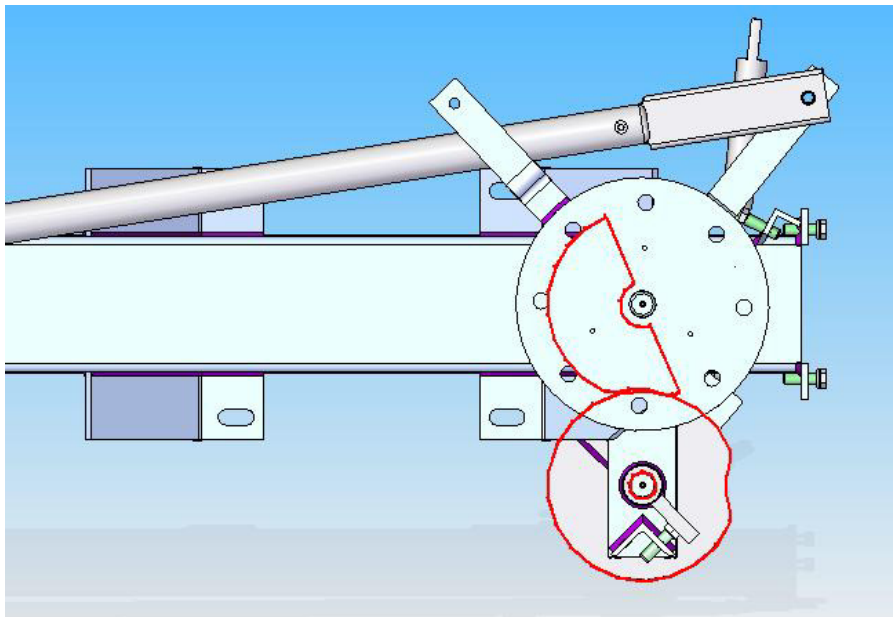
## 24.0. INTERLOCK POSITION IN BASE ASSEMBLY

### INTERLOCK FREE CONDITION



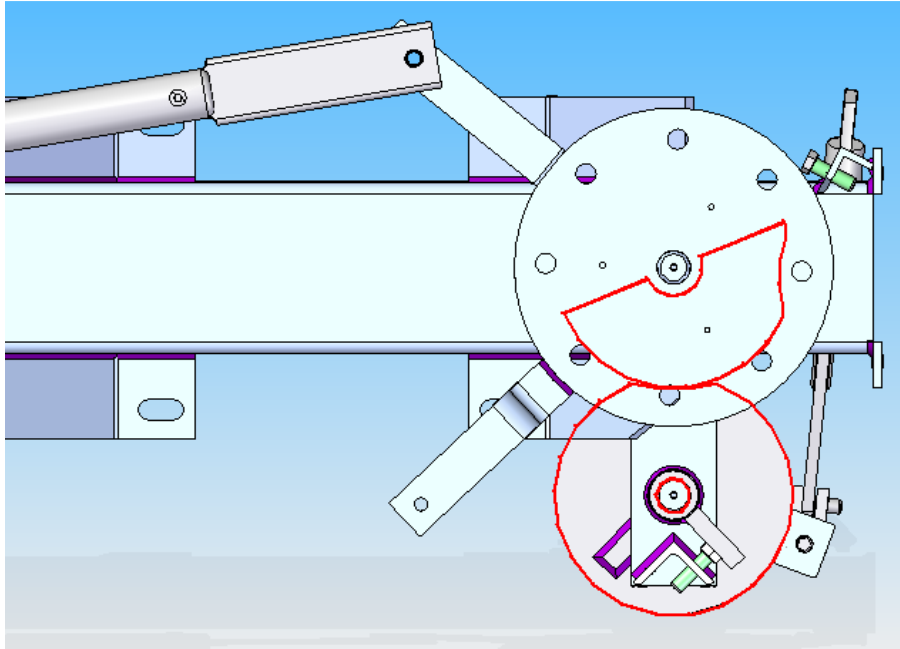
In the above condition both the cams are free to rotate either earth switch or disconnector can be operated during the operation, the interlock cam will rotate on the interlock, operated of disconnector or earth switch.

### EARTH SWITCH IN CLOSED CONDITION



In the above condition the disconnector cannot be operated, since the earth switch CAM is obstructing the movement of the disconnector CAM.

## DISCONNECTOR IN CLOSED CONDITION



In the above condition the earth switch cannot be operated. The disconnecter cam is obstructing the movement of the earth switch cam.

## **SECTION – D**

### **COMMISSIONING AND MAINTENANCE**

#### **25.0. COMMISSIONING OF DISCONNECTOR:**

- Carry out test operation manually; ensure satisfactory engagement of contacts for all three poles. If necessary, align the contacts.
- Operate the disconnecter by power. Ensure proper open/close operation. Ensure limit switch / auxiliary switch settings are proper.

#### **26.0. COMMISSIONING OF EARTH SWITCH:**

- Carry out test operation manually, Ensure symmetrical engagement of contacts.
- In case of motor operated earth switch, operate the earth switch by power. Ensure proper open/close operation.

#### **27.0. MAINTENANCE:**

##### **Caution:**

- **Working on high-voltage is very dangerous; hence follow substation and other standard safety rules.**
- Don't use emery paper for cleaning the contacts.
- Don't try to operate the Earth switch when Disconnect or is in closed condition.

##### **Do:**

- Ensure disconnection of circuits before doing maintenance activity.
- Do proper earthing of the circuit.
- Stay clear of adjacent live parts; wherever possible, earth the adjacent live parts.
- Use proper tools.

We recommend the following inspection intervals

- Normal ambient condition: After every 5 years or after every 1000 operations (Close/open cycle).
- Extreme ambient conditions i.e. Climate (tropical) and heavy contamination (dust, salt, rust and Sulphur): After every 2 years or after every 500 operations (Close/open cycle).

#### **28.0. TOOLS AND TACKLES:**

Apart from standard tools, the following are required

- Brass wire brush for cleaning of Copper surfaces.
- Steel wire brush for cleaning for Aluminum and steel surfaces.
- Contact grease (Petroleum jelly).
- Cold cleaning agent for Silver plated surfaces.
- Lint – free cloth's

## **29.0. CLEANING:**

Bolted or sliding contact surfaces that conduct current have an effect on the electrical resistance of the current path. Dirty or oxidized contact surfaces increase the electrical resistance. This will result in damage to main contacts. Hence the following cleaning procedure shall be strictly adhered to:

Bolted Contact Surfaces: Aluminum

- Grease lightly.
- With steel wire brush, remove oxide film fully (Do not use emery paper).
- Wipe off contaminated grease immediately using lint – free cloth.
- Re-apply grease again (Immediately after cleaning with lint –free cloth).
- Bolt together treated surfaces and grease joints.

Silver plated contact surfaces.

- Clean with cold cleaning agent (do not destroy silver surfaces).
- Grease immediately.
- Bolt together treated surfaces and grease joints.

Silver plated contact surfaces (Sliding)

- Clean with cold cleaning agent (do not destroy silver surfaces).
- Grease immediately

## **30.0. INSPECTION CHECKS:**

The following operations must be carried out during inspection

### **Disconnecter:**

- Clean contact area (Male and Female contacts). Check for any damage; if required, change the contacts.
- Apply grease on contact surfaces.
- Clean the insulators. Check for any damage; if required, change.
- Check all bolted connections.
- Carry out three or four test operations manually.
- Reconnect the power supplies and control voltage.
- Carry out three or four test operations electrically.

### **Free Entry Earth Switch:**

- Clean contact area (Male and Female contacts). Check for any damage; if required, change the contacts.
- Apply grease on contact surfaces.
- Check the earthing connections between earth blade and disconnector base; if required, replace.
- Check all bolted connections.
- Carry out three or four test operations electrically (in case of power operated).

### **31.0. RECOMMENDED SPARES:**

Keep adequate quantity of following spares at all times.

- Fixed contact fingers.
- Moving contact extrusion.
- Clevis pins with nylon washers, split pins.
- Control springs.
- Carry out three or four test operations manually.
- Reconnect the power supplies and control voltage.



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