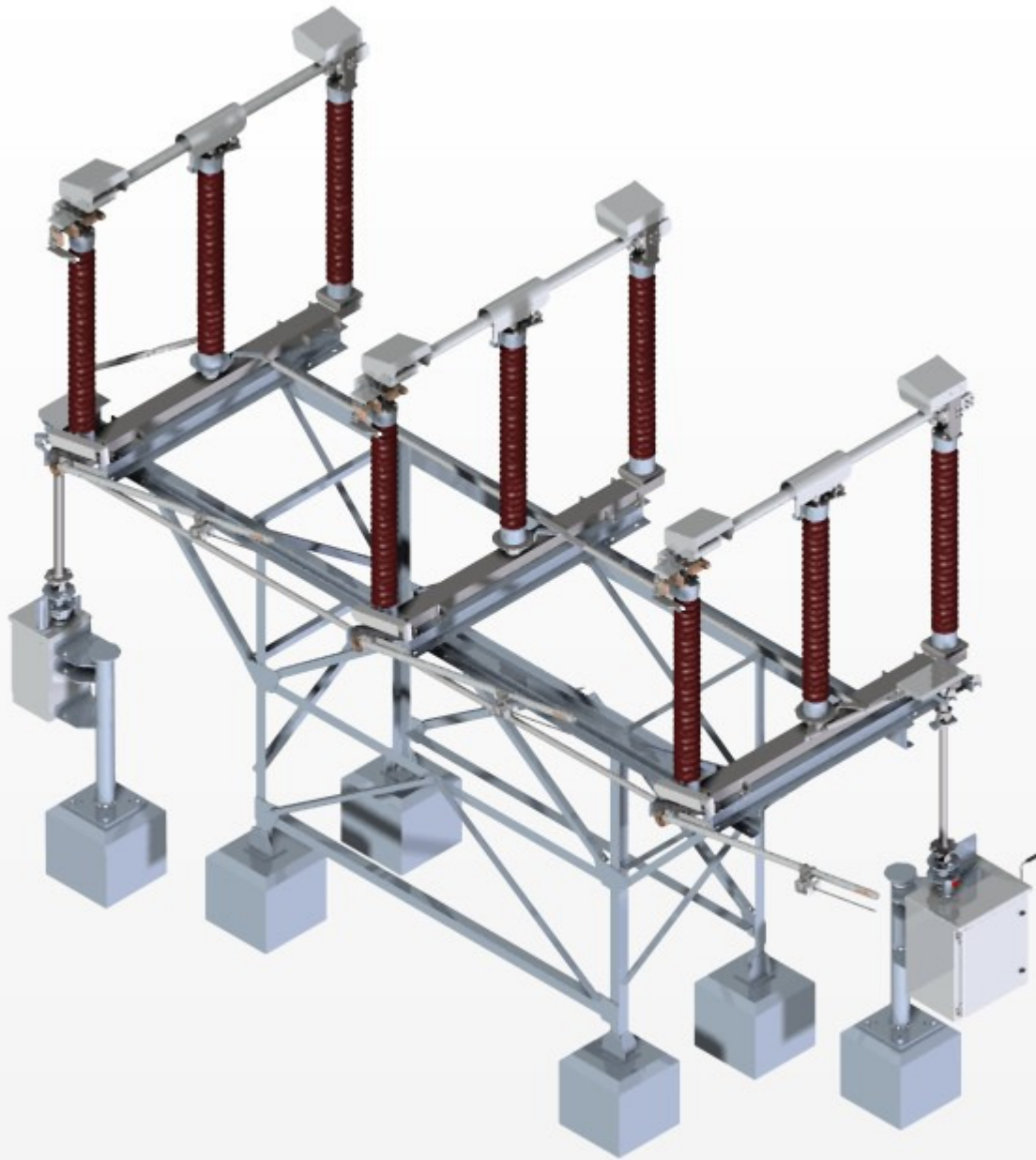


**UNLOADING, STORAGE, ERECTION,  
INSTALLATION & MAINTENANCE MANUAL**



**DOUBLE BREAK DISCONNECTOR  
(TYPE: RD 145 – G, ES1 145 – G, ES2 145 – G)**

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 condition are, whether they are in the freezing cold or in the extreme hot.

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## **1.0. PREAMBLE:**

The Disconnecter 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 offload mechanical switching device used to isolate equipments and lines in electrical network. They can be able to make or break a current  $\leq 0.5$  Amp at 0.15 power factor.
- 145 kV Double Break Disconnecter is 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. Disconnecter and earth switches can be operated either manually or by motor.
- 145 kV Double Break Disconnecter 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 IS: 9921. For insulators IEC: 60273 / 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 **Mr. S.R. Kumaresh** of **S&S Power Switchgear Equipment Limited**. Email: [srk@ssppower.com](mailto:srk@ssppower.com).
- Segregate the crates, voltage rating wise. Colour codes are provided in individual crate / box for each voltage rating.  
(White – 36kV, Yellow – 145kV, Green – 245kV & Blue – 420kV)

#### 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

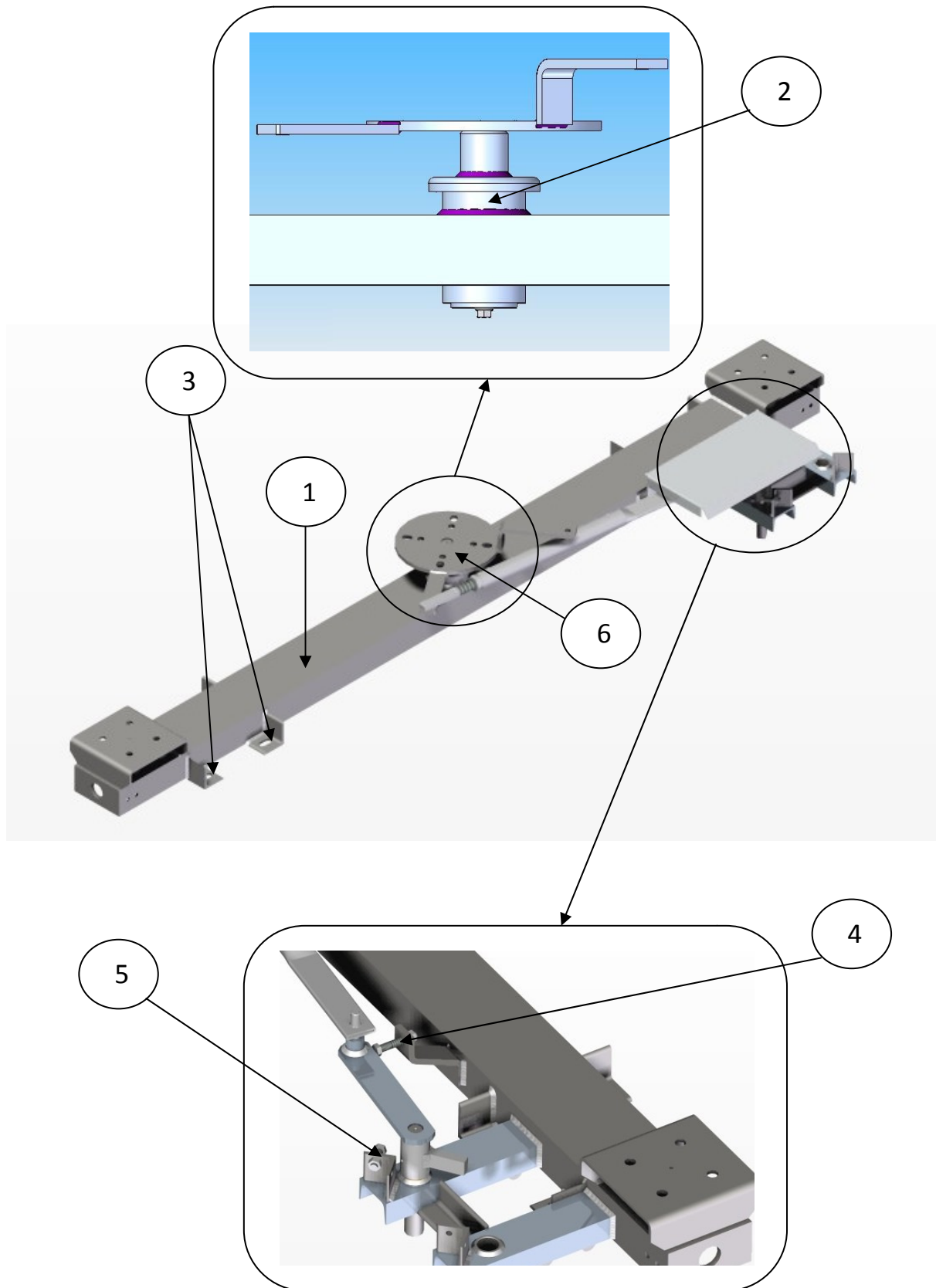
Our 145kV Double Break Disconnecter comprises the following:

- 4.0. Base assembly.
- 5.0. Moving blade assembly.
- 6.0. Fixed contact assembly.
- 7.0. Operating mechanism (Main).
- 8.0. Operating mechanism (Earth).
- 9.0. Down operating pipe (Main & Earth)
- 10.0. Tandem pipe assembly (Main & Earth).
- 11.0. Earth switch assembly (Optional).
- 12.0. Earth fixed contact assembly (Optional).
- 13.0. Insulators (Optional).
- 14.0. Support structure (Optional).

#### **4.0. BASE ASSEMBLY:**

- Each 3 pole disconnector (R, Y, B) is supplied with three types of base assemblies.
  - a) One base assembly (say R pole) with drive arrangement.
  - b) Other base assembly (say Y pole) without drive arrangement.
  - c) Other base assembly (say B pole) with drive arrangement and interlock arrangement (if the switch is with earth).
- The base consists of a hot-dip-galvanized steel channel (1) (**See figure. A**).
- Bearing shaft is assembled in a 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 shaft in assembled and aligned condition.
  - b) Torque bearing (Drive arrangement) for Main and Earth in assembled condition (only for drive and follower end).
  - c) Inter locks arrangement in pre-set condition.
  - d) Lever and hinges with pins, Friction washer, Brass washers and Split pins.
  - e) Eight legs with slots (3) for fixing the base channel to the supporting structure.
  - f) The mechanical limit stop of the disconnector in “closed” position (4) and another limit stop in “open” position (5) for disconnectors.
  - g) One rotating support (6) with two fixed support.

**FIGURE - A**



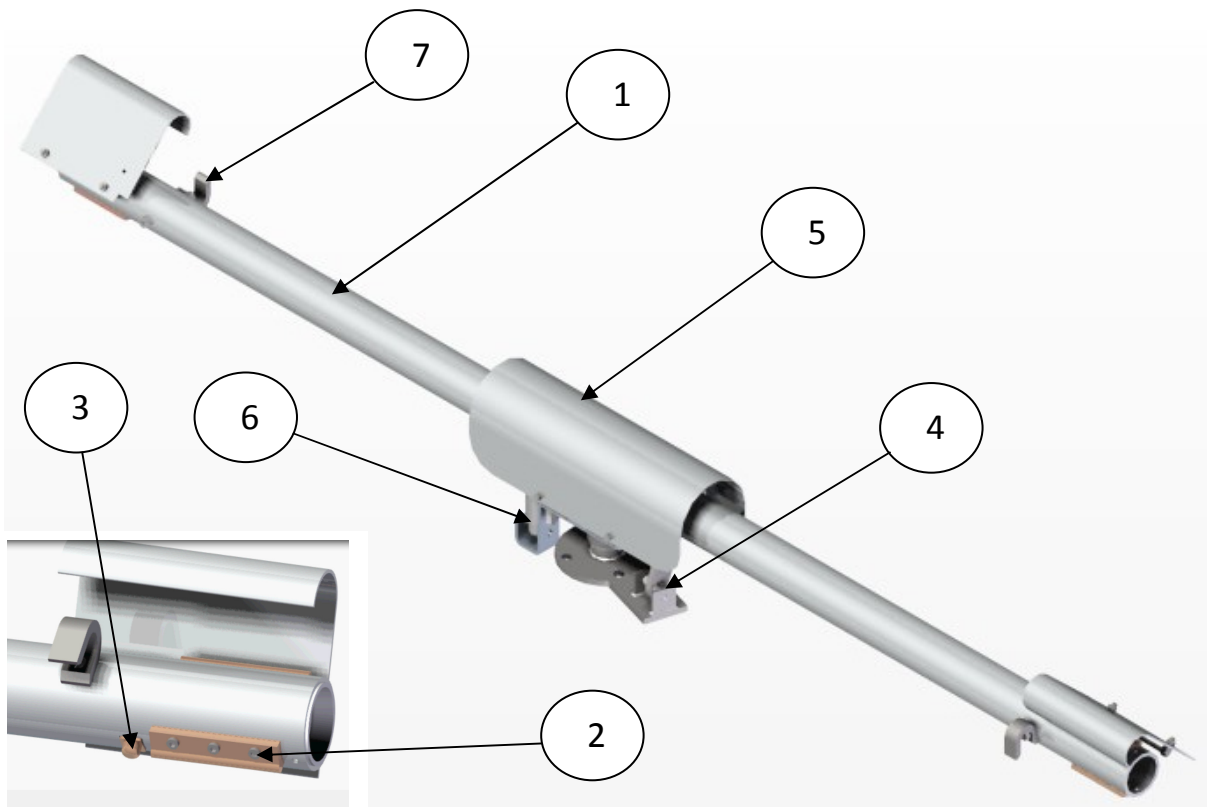
## SINGLE POLE ASSEMBLY



## 5.0. MOVING BLADE ASSEMBLY:

- The current carrying moving blade is made of Aluminium / Copper tube (1). (See figure. B).
- At the end of the tube, Moving contact (2) is bolted which is made of electrolytic copper in extruded form 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.
- At the end of the tube, bus transfer contact (3) is bolted which is made of tungsten material. Ice shield is provided to protect the contact from snow/ice formation.
- The actuator assembly (4) is mounted inside the actuator housing covered by rain hood (5), provided in the centre of the moving blade. The actuator housing supports the blade with bearing collars and toggle bearing which are fitted with seals. A spring loaded linkage (6) in the housing (Turn & Twist arrangement) retains the blade in position. When the contact enters freely into the fixed contact assembly. When the insulators further rotates, the blade twists to make complete contact with the fixed contacts.
- Hook (7) is provided in the tube to hold the fixed screw in fixed contact by turn and twist mechanism to safeguard accidental opening of moving blade from short circuit force, wind force, vibration force etc.,

**FIGURE-B**

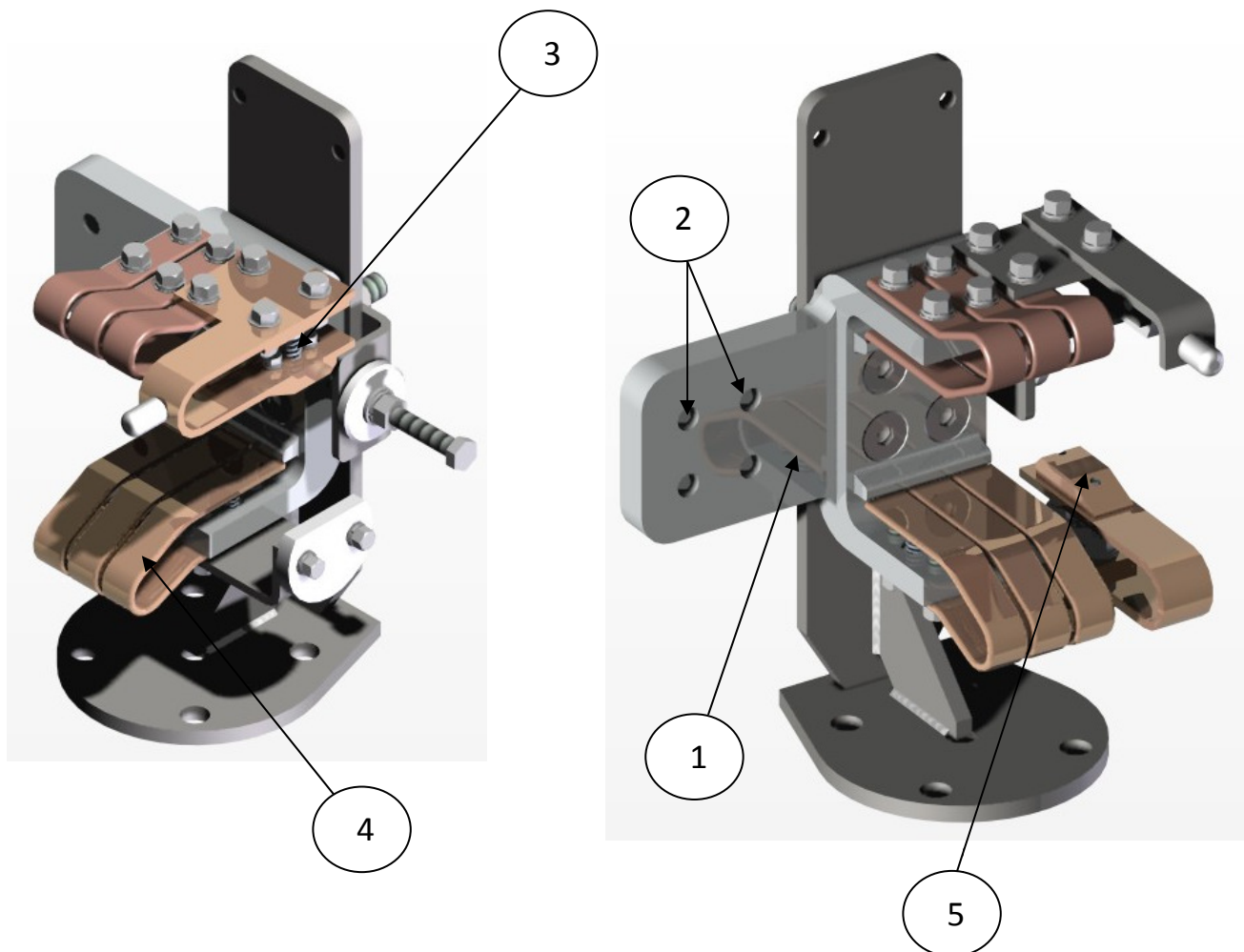


**HAMPER ASSEMBLY**

## 6.0. FIXED CONTACT ASSEMBLY:

- The Aluminium casting (1) has provisions to fix the fixed contact as well as for mounting the earth fixed contact for an earthing switch / terminal connectors (2). (See figure. C).
- The fixed contact consists of multi-finger reverse-loop pattern. Contact pressure is applied to each individual finger by an insulated stainless steel spring (3). Contact fingers (4) are of hard drawn copper, silver plated and are bolted into support.
- Electrolytic corrosion between the fingers and aluminium alloy is inhibited by doing tin plating at the bottom side (contact surface with aluminium casting) of finger and also application of electrical jointing compound during assembly.
- Bus transfer contact (5) is bolted which is made of tungsten material.
- Ice shield is provided to protect the contact from snow/ice formation.

**FIGURE-C**



## **FIXED CONTACT ASSEMBLY**

## 7.0. OPERATING MECHANISM (MAIN):

- 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.
- 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**

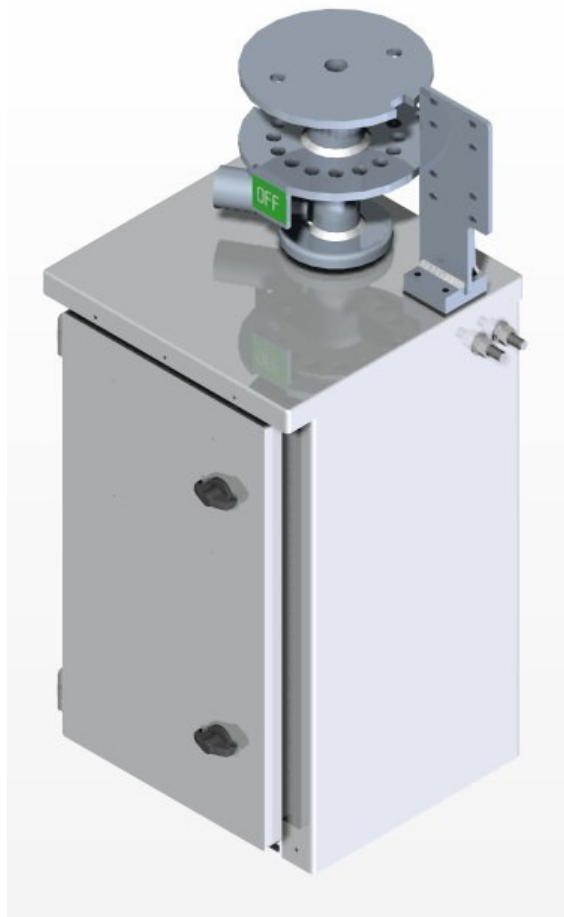


**DRIVE BOX - MAIN**

## 8.0. OPERATING MECHANISM (EARTH):

- Our operating mechanism is operated by a insulated steel galvanized operating pipe with 1 meter length.
- 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. E)

**FIGURE – E**

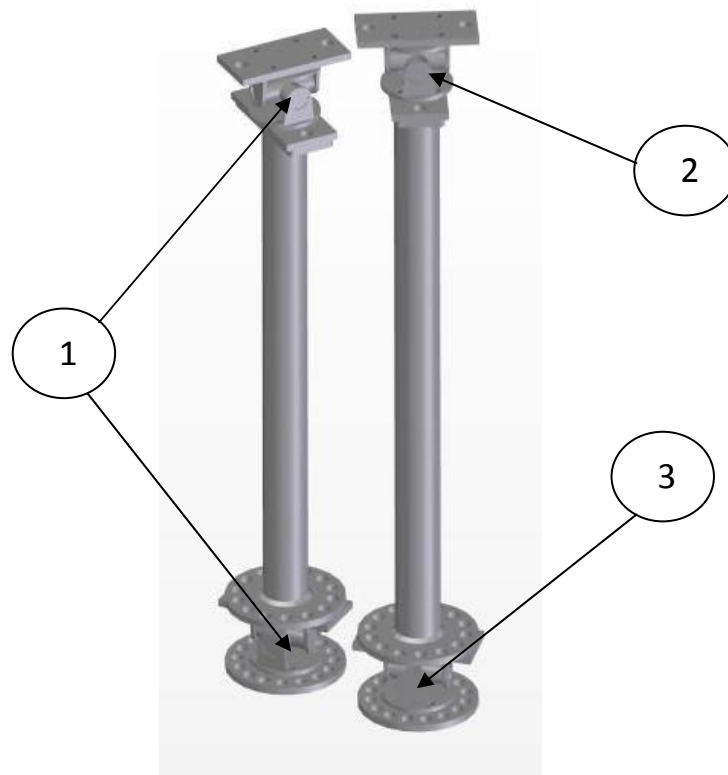


**DRIVE BOX - EARTH**

## 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. F).
- 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. Two Universal joint (1), one with 'T' Bar (2) and other on the vernier flange (3) of the drive mechanism.

**FIGURE – F**

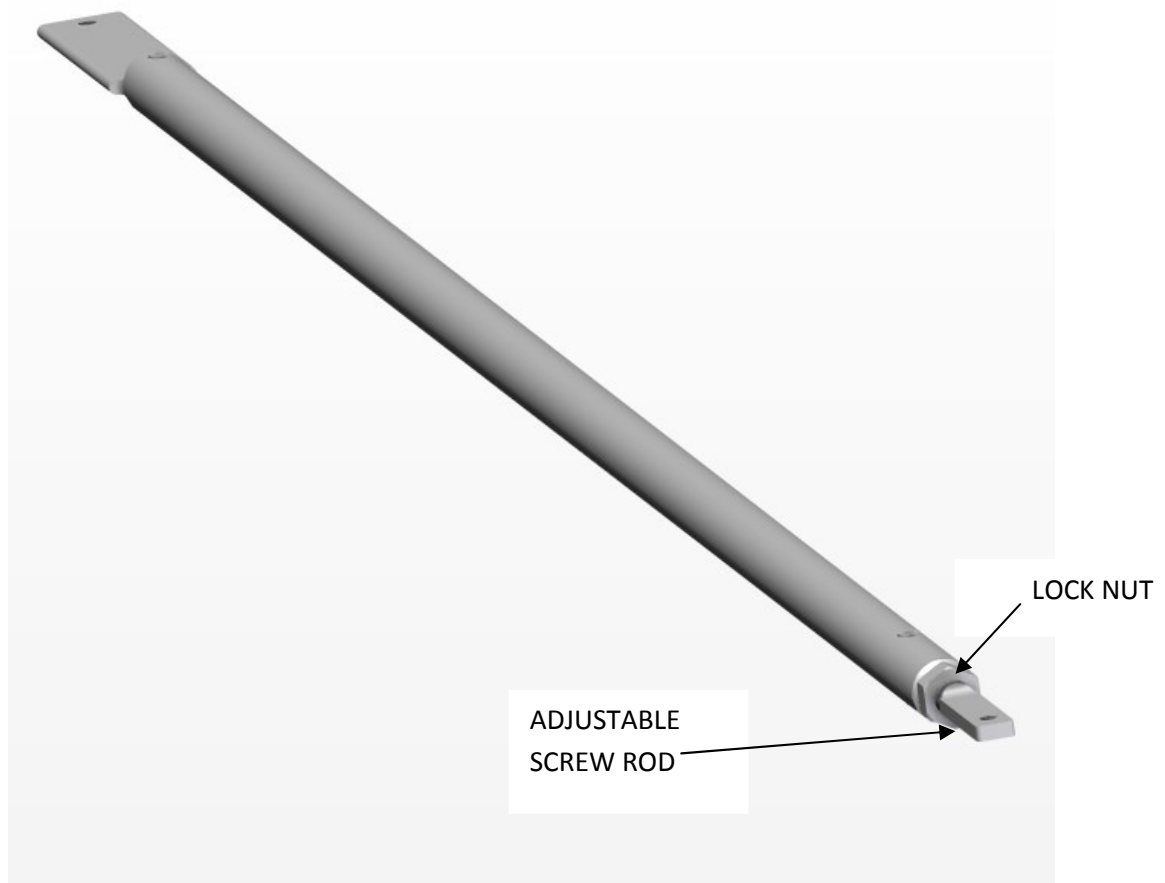


**DOWN OPERATING PIPE**

#### 10.0. TANDEM PIPE(MAIN & EARTH):

- The tandem pipe assembly is used to connect the adjacent poles for gang operation of all the three poles with one drive mechanism. The lengths are adjustable through screw rod with lock nut arrangement to suit minor variation at site. (See figure. G)
- These parts are hot-dip galvanized and assembled with necessary pins, brass washers, nylon washers & bushes etc.

**FIGURE - G**

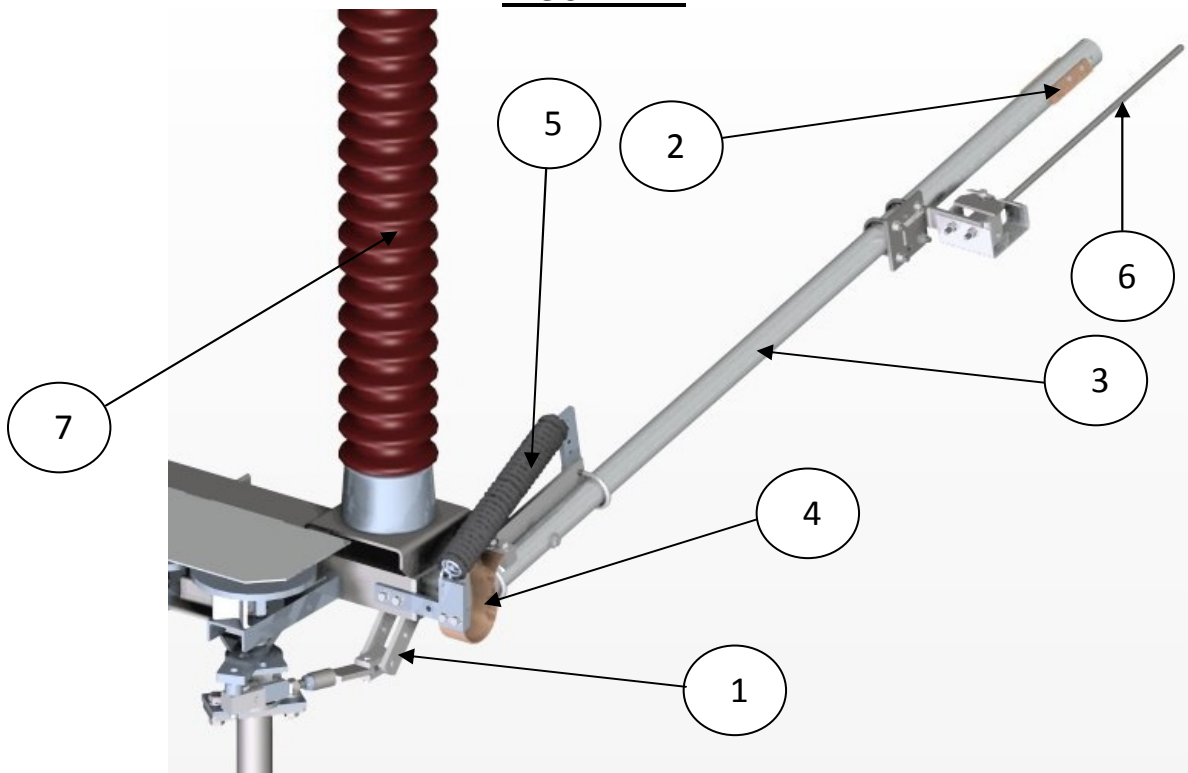


**TANDEM/GANG PIPE**

## 11.0. EARTH SWITCH ASSEMBLY. TYPE- ES1 & ES2 145 – G:

- 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. H)
- At the end of the tube, Moving contact (2) is bolted which is made of electrolytic copper in extruded form with silver plating on contact side and tin plating in fixing side (with Aluminium / Copper Tube (3)).
- Mounting Plate, “U” clamp 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 will vary according to the short-circuit withstand capability) for the connection to the earthing switch to the base assembly.
- Spring is provided with bellow (5) at the bottom of the tube to retain the earth switch blade in its position.
- Earthing switch designated to be used in circuits having relatively long lines or high coupling to adjacent energized circuits are provided with induced current contact (6). Induced current contact is used to make before and break later the electromagnetically / electrostatically induced current. Ice shield is provided to protect the contact from snow/ice formation.

**FIGURE – H**

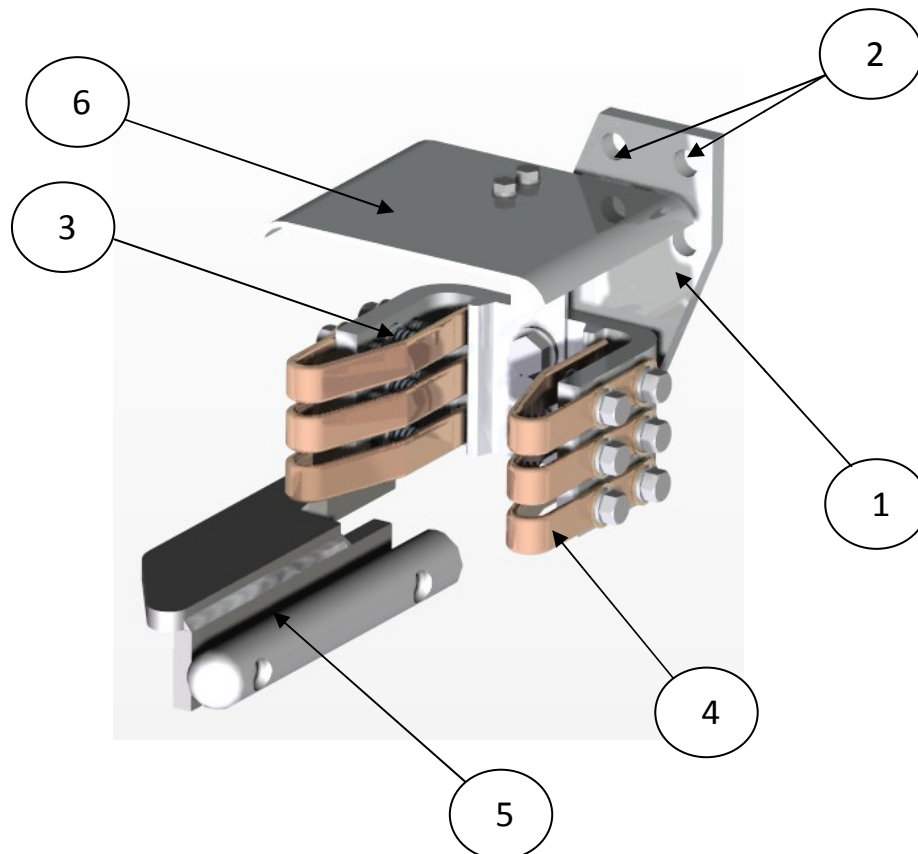


**EARTH SWITCH**

## 12.0. EARTH FIXED CONTACT ASSEMBLY:

- The Aluminium dropper plate (1) has provisions to fix on main fixed contact (2). (See figure. I).
- The fixed contact consists of multi-finger reverse-loop pattern. Contact pressure is applied to each individual finger by an insulated stainless steel spring (3). Contact fingers (4) are of hard drawn copper, silver plated and are bolted into support.
- Electrolytic corrosion between the fingers and aluminium alloy is inhibited by doing tin plating at the bottom side (contact surface with aluminium casting) of finger and also application of electrical jointing compound during assembly.
- Secondary contact (5) is provided to make contact with induced current contact to discharge the electromagnetically / electrostatically induced current. Ice shield (6) is provided to protect the contact from snow/ice formation..

**FIGURE – I**



**EARTH FIXED CONTACT**

### **13.0. INSULATOR ASSEMBLY:**

- Insulators (7) are selected to meet the basic insulation level, minimum creepage and minimum bending load to suit the Customer / Design requirement. **(See figure. H).**

### **14.0. 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's place 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, vibration, wind force and dead load etc.

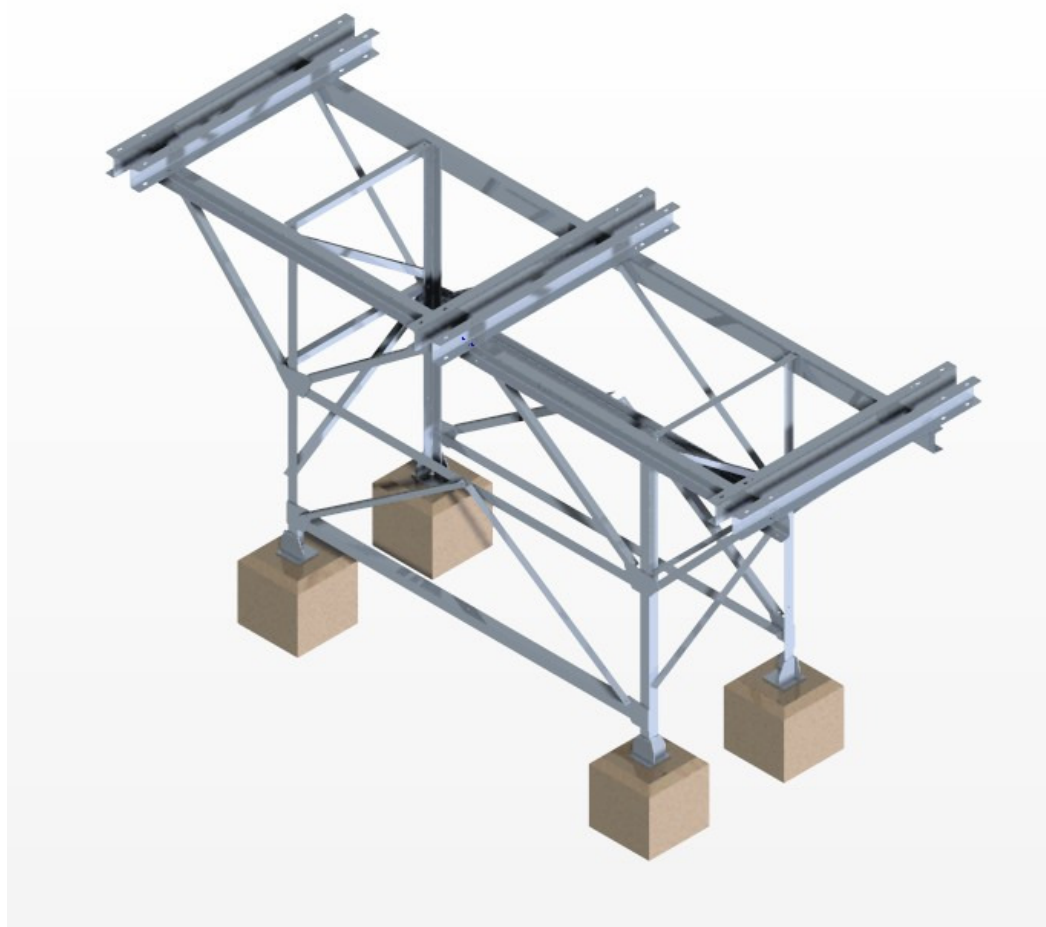
## SECTION – C

### INSTALLATION & SETTING INSTRUCTION

#### 15.0. ERECTION SEQUENCE:

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

#### 16.0. 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.

## 17.0. 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. J**) 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. K**) 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.

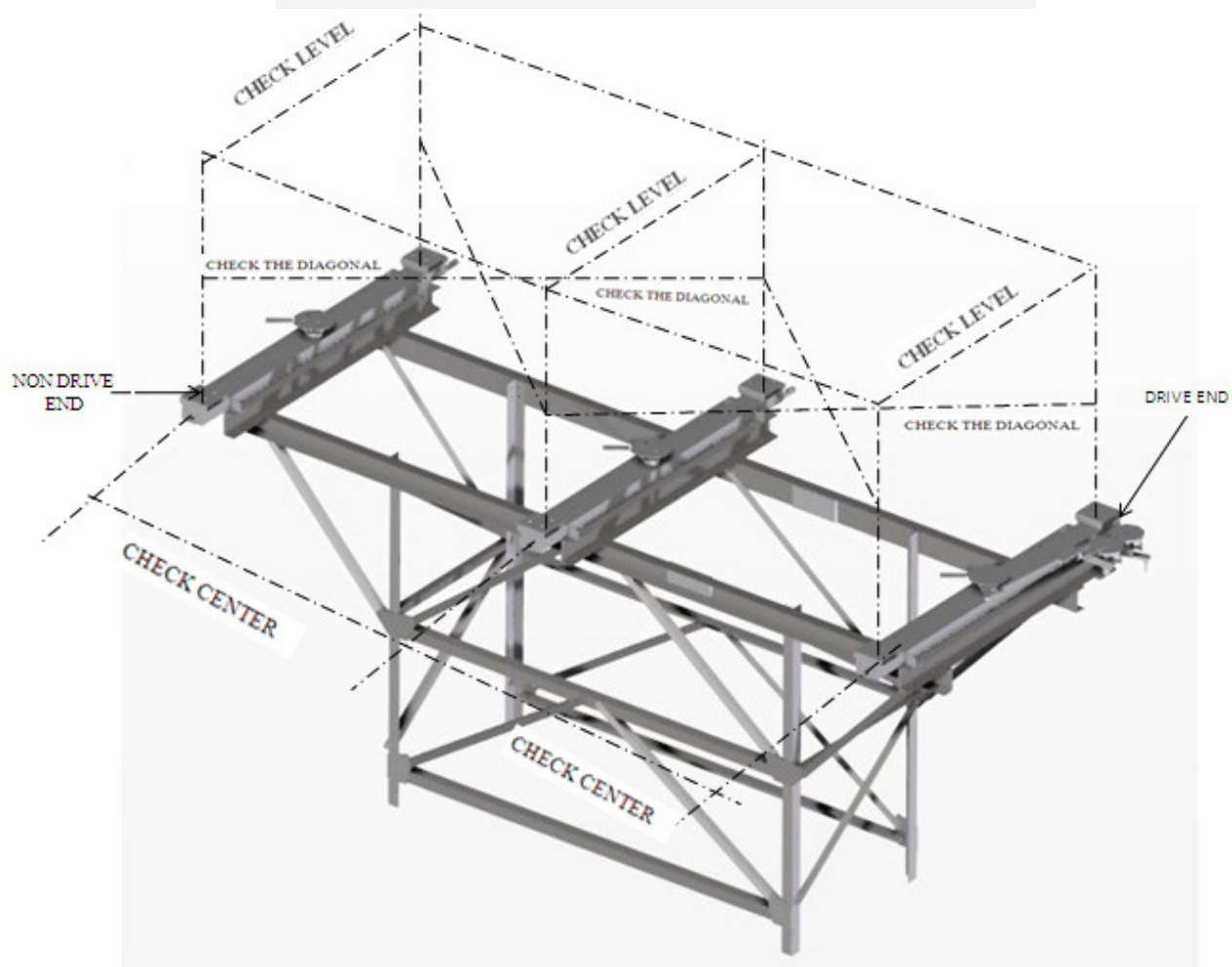
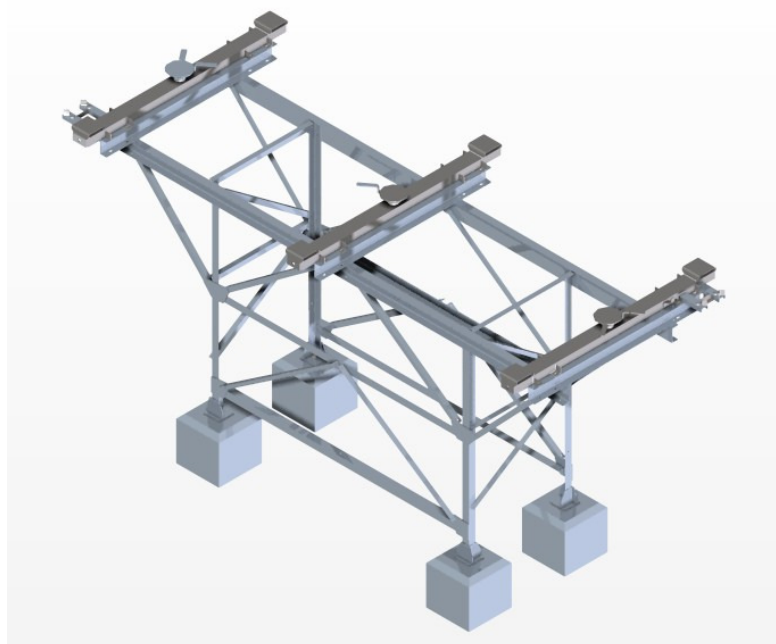
**FIGURE - J**



**LIFTING OF BASE ASSEMBLY**

**FIGURE – K**

**ALIGNMENT AND LEVELLING OF BASE WITH STRUCTURE**



## 18.0. INSULATORS:

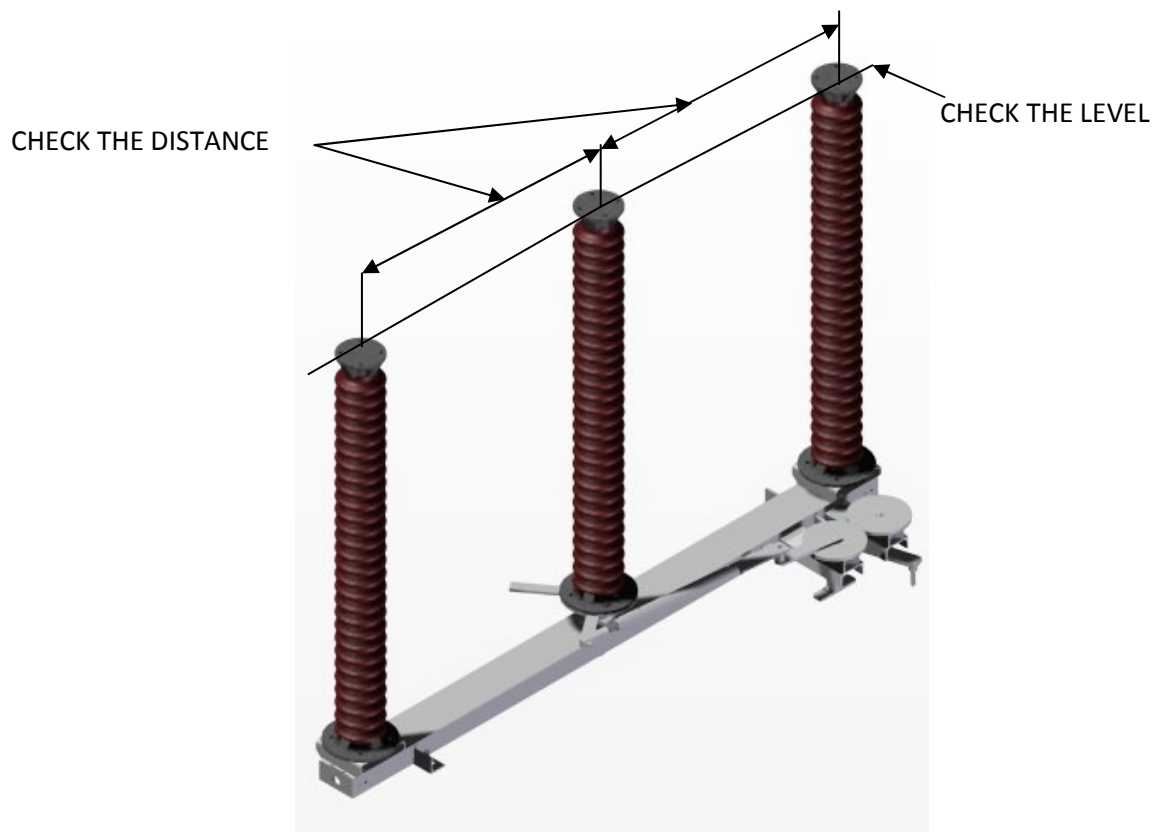
Before Start of erection

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

### Erection

- Lift the insulator by using proper Cloth / Nylon sling and place it over the base assembly (Middle). (Ensure top 4 holes of insulator are parallel to base center line).
- Without removing the sling match the bottom fixing holes and fix all bolts.
- Remove the sling and check for level of the top surface of insulator by spirit level / plumb (See figure. L).
- If necessary add shims below the bottom flange of the insulator.
- Rotate the shaft assembly and check for the rotation of insulator (eccentricity) for middle and – ensure the verticality.
- Repeat the same for other stacks also.

**FIGURE - L**



## **ERECTION OF INSULATOR**

## 19.0. FIXED CONTACT ASSEMBLY:

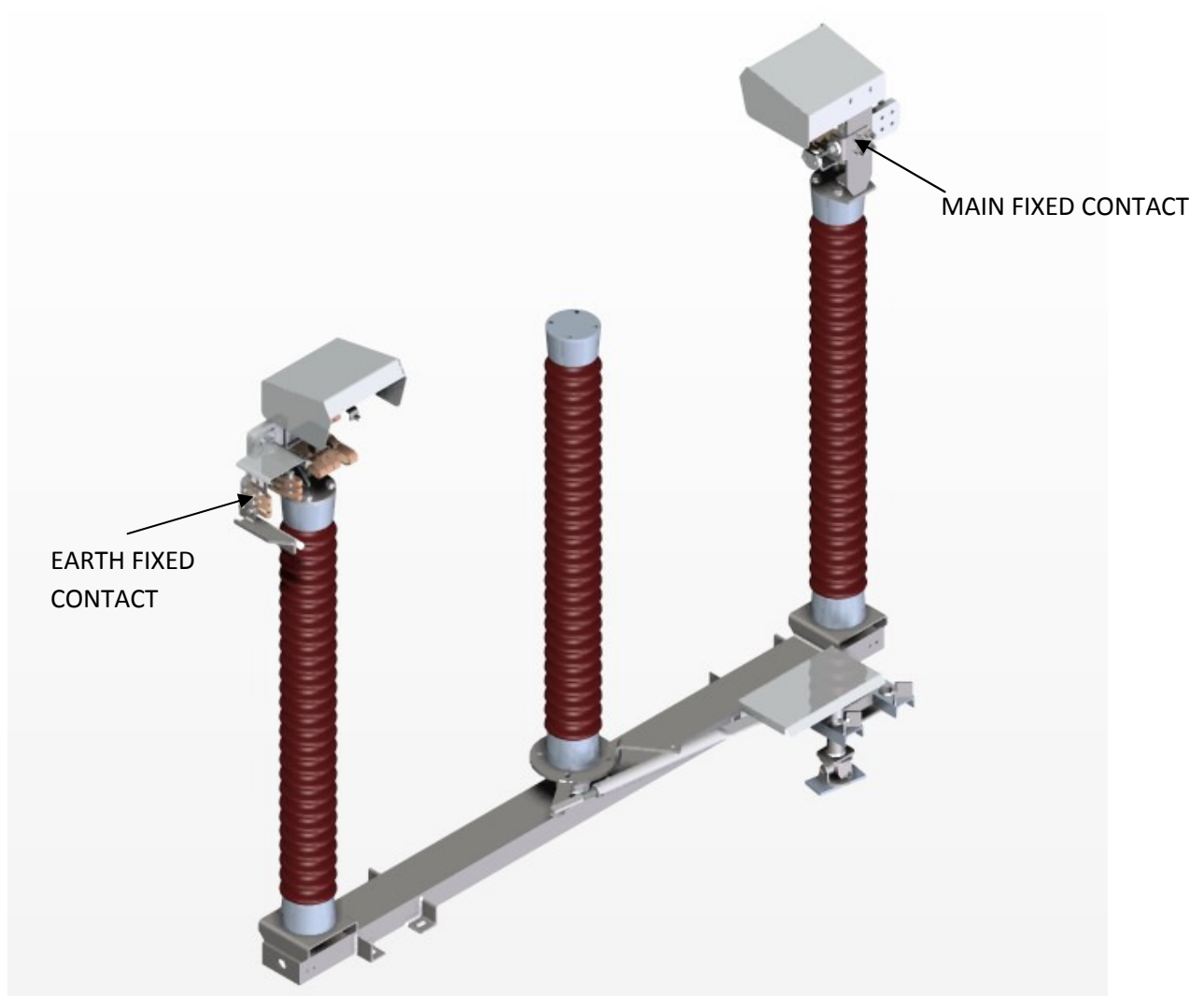
Before erection

- Identify the Moving blade, fixed contacts & Earth fixed contact.
- Keep the fixing hardware.

### ERECTION

- Lift the Fixed Contact Assembly and place it over the Insulator and tighten the bolt (Hand tight) (See **figure. M**).
- Repeat the same for the other side.
- Repeat the same for the other two poles also.

**FIGURE – M**



## **MOUNTING OF FIXED CONTACT ASSEMBLY**

## 20.0. MOVING BLADE ASSEMBLY:

- Identify the opening position of the moving blade by referring general assembly drawing.
- Keep the bearing shaft assembly in open position.
- Lift the moving blade assembly by using proper rope and place it over the insulator. Ensure the position of operation.
- Without removing the rope align the holes with insulator and fix the bolts (Hand tight).
- Rotate the moving blade through shaft assembly and check for free entry of blade into fixed contact.
- If the blade is not entering freely align properly by using shims below the fixed contact on both / one side and / or adding shims below the pedestal plate of moving blade (See figure. N).
- After alignment check for free entry and after full close check for equal contact pressure on both sides.
- Repeat 2 to 3 times and ensure the alignment and full tight all bolts.
- Repeat the same for other two poles also.

**FIGURE – N**



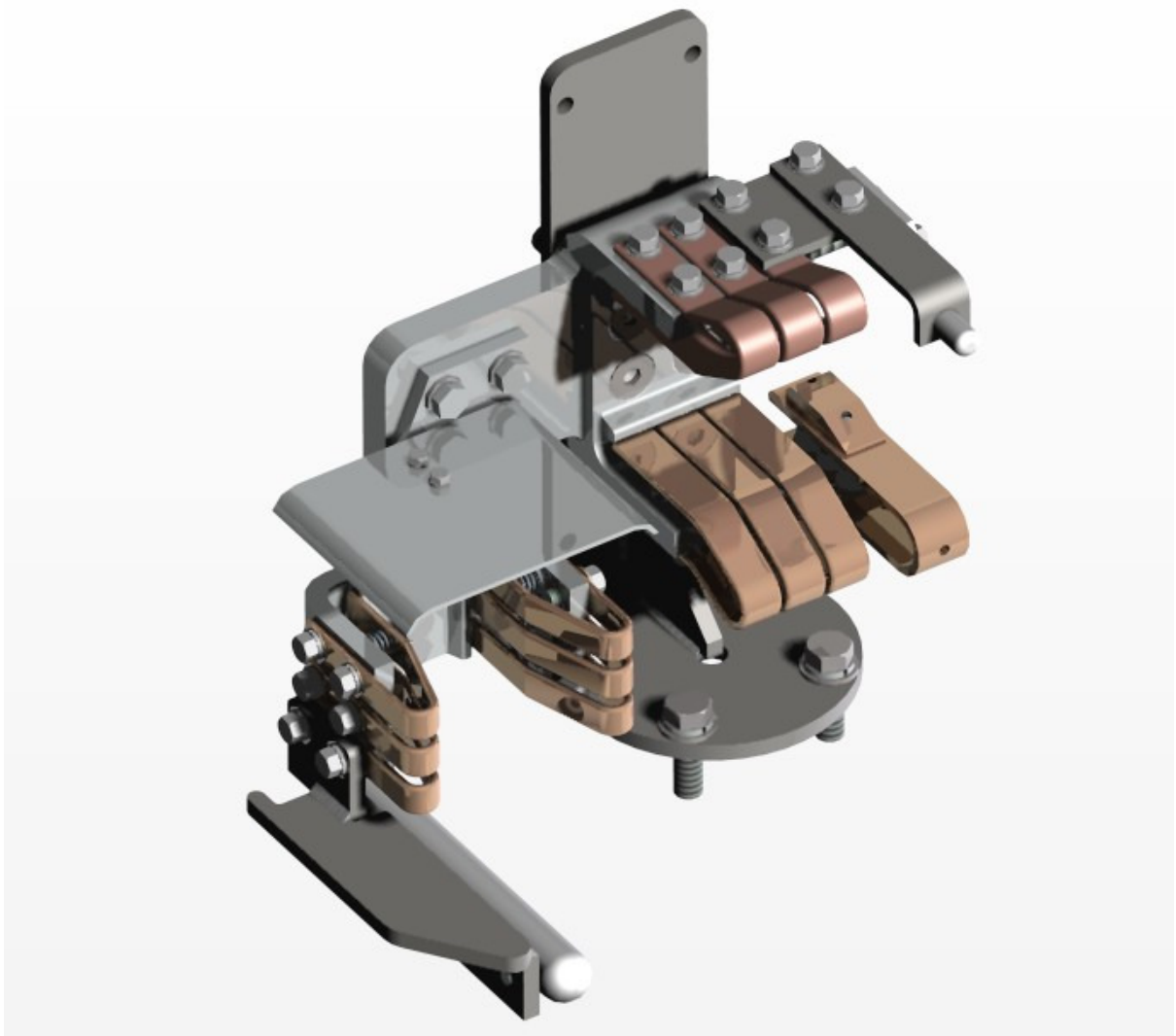
## 21.0. EARTH FIXED CONTACT ASSEMBLY:

- Identify the earth fixed contact assembly and direction to fix the earth fixed contact assembly through contracts GA drawing. (See **figure O**).
- Identify the case with the help of packing list and open the case carefully.
- Take the earth fixed contact assembly and fix it to the main fixed contact assembly by using M12 bolts and nuts as per GA drawings.

**Note:**

The above assembly can be carried out before installing the main fixed contact assembly over the insulator also.

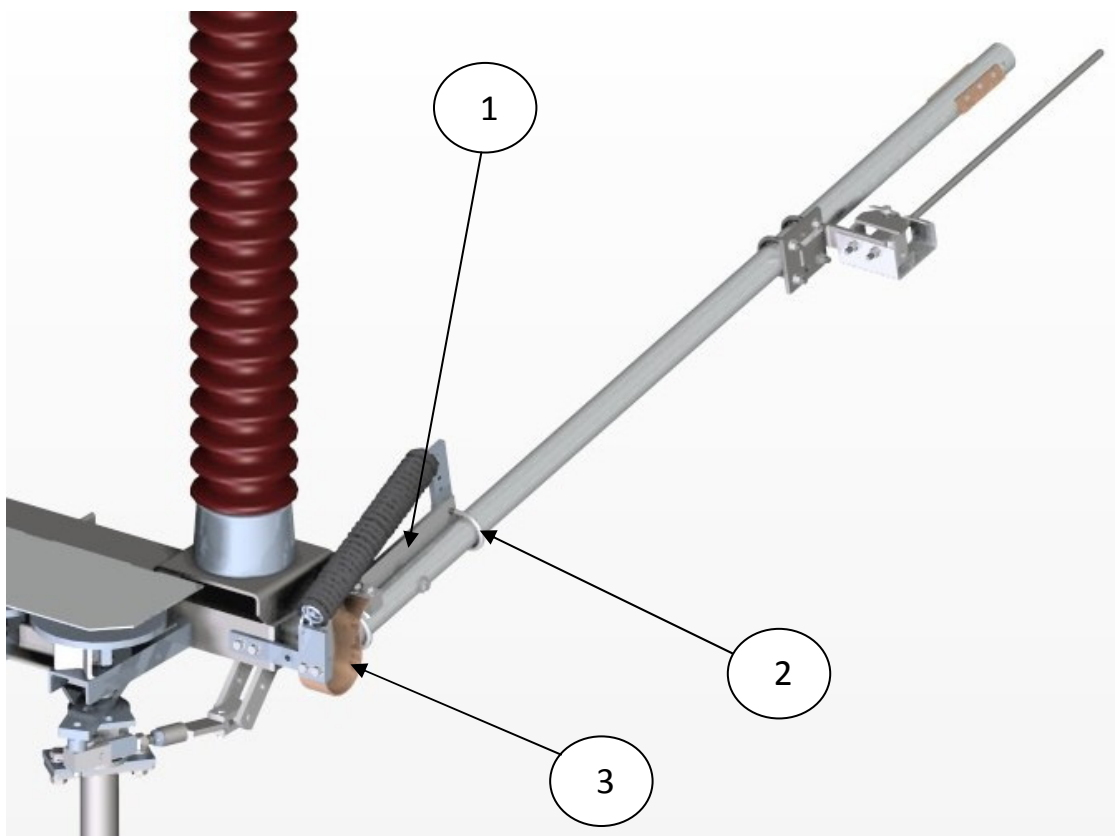
**FIGURE - O**



## 22.0. EARTH SWITCH ASSEMBLY:

- Identify the drive & non-drive earth switch and fixing side of the earth switch by referring to the GA Drawings.
- Earth tube fixing brackets (1) are mounted to the bases at factory itself.
- Remove the 'U' clamp (2) and centre bolt from the bracket.
- Fix the earth blade with flexible connector (3) in position and fix the centre bolt.
- Fix the 'U' clamp and tighten all bolts and nuts (**See figure P**).
- Fix the earth strip (Which is connected to flexible connector) to the base.
- Move the earth blade to close position manually, check the position and if required, align the earth fixed contact through the slots provided in the bracket.
- Fix the spring along with the bellow while the earth switch in closed position.
- Repeat the above procedure on the other two poles also.

**FIGURE – P**



### 23.0. OPERATING MECHANISM AND DOWN OPERATING PIPE:

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 Q).
- 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 retighten bolts with the help of vernier flange 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 switches are mounted in the rear side of the cabinet connected to gear shaft through cam and operating lever. It consists 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 mal functioning, 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 inturn 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**

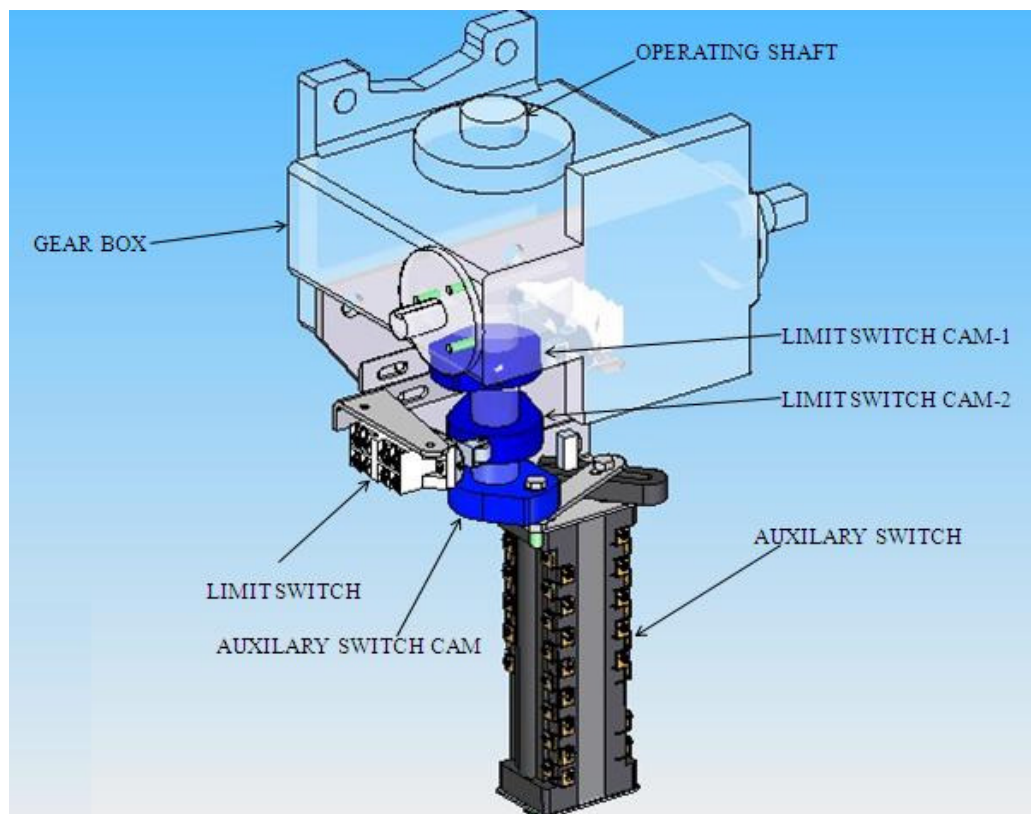
- At this condition the coil plunger will pass through the interlock cam and top guide plate by spring inside the coil (coil de-energized condition).
- The interlock cam is protected from rotation by plunger, which is guided by top and bottom guide plate.
- At this condition there will not be supply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



## **OPERATION OF AUXILIARY SWITCH OPERATION / 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**

- Keep the main Disconnecter 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 within 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.

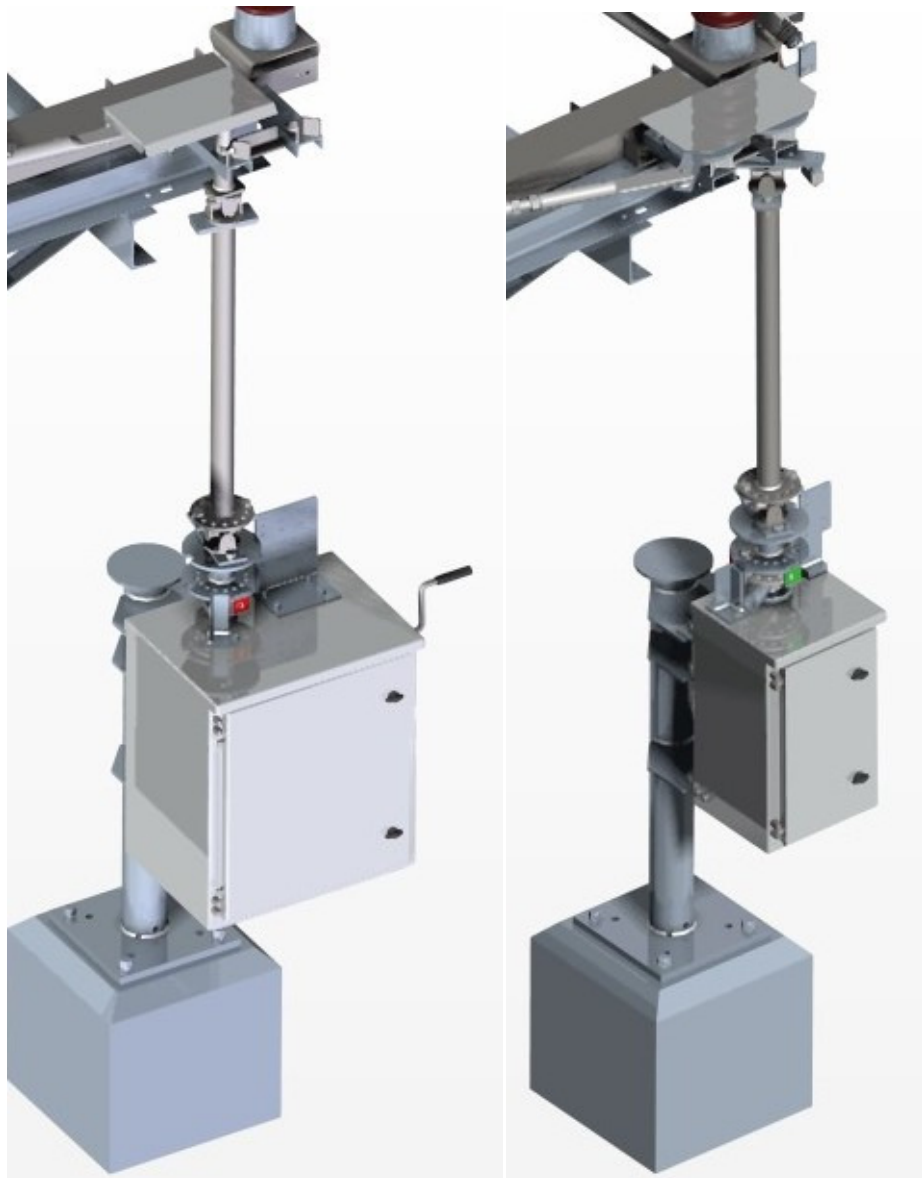
#### **Note:**

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

## SETTING

- Operate the disconnecter manually to open position.
- Rotate the cam and press the Limit switch roller till it disconnects the contact (a click sound will be heard).
- Again close the disconnecter manually.
- Now operate the disconnecter by motor and see that the operation is completed by limit switch.
- If any further small adjustment is required, the cam can be rotated towards roller or away from roller.
- In the same way another switch (for closing) can be set.

**FIGURE – Q**



MAIN - MOTOR

EARTH - MANUAL

## DRIVE ASSEMBLY

### 24.0. TANDEM PIPE ASSEMBLY(MAIN & EARTH):

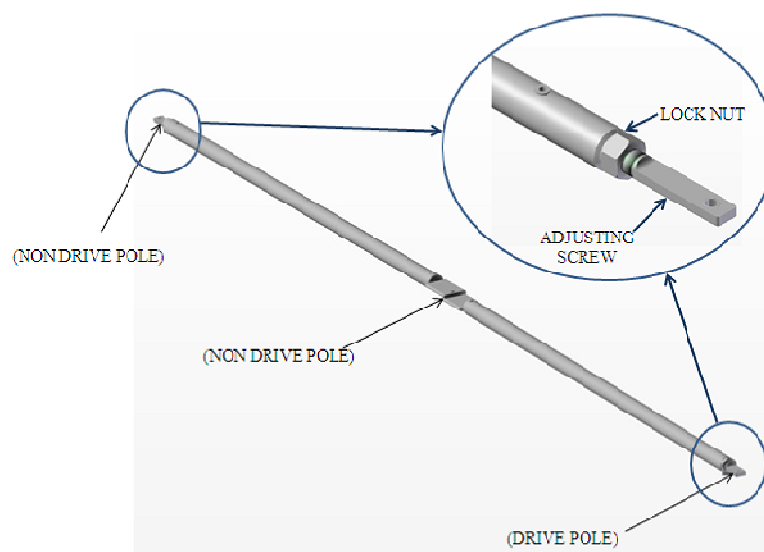
#### Disconnecter:

- Remove the connecting pin, brass washers, nylon washers from the lever and keep it separately.
- Keep the drive pole of 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 through loosening the lock nut.
- Likewise, with the drive pole & second pole in closed condition, keep the third pole also in closed condition and connect the tandem pipe between the second & the third pole.
- Operate the disconnecter manually and ensure it opens and closes properly. If not, then adjust the tandem pipe length.

#### Earth switch:

- Keep the drive pole of earth switch in open position.
- Keep the second pole in open position. Connect the tandem pipe (Phase coupling pipe). If required extend or shorten by adjusting the screw rod through loosening the lock nut.
- Likewise, with the drive pole & second pole in open condition, keep the third pole also in open condition and connect the tandem pipe between the second & the third pole. (See figure. R).
- Operate the earth switch manually and ensure it opens and closes properly. If not, then adjust the tandem pipe length.
- Ensure all split pins brass washers, nylon washers are secured properly

**FIGURE - R**



## 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 disconnector 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 Disconnector 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.
- Cold cleaning agent for Silver plated surfaces.
- Lint – free cloth.

**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.

**Inspection checks:**

The following operations must be carried out during inspection

**Disconnecter:**

- Clean contact area (moving blade and main fixed contact 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 (moving blade and earth fixed contact 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 manually.
- Reconnect the power supplies and control voltage.
- Carry out three or four test operations electrically (in case of power operated).

**29.0. RECOMMENDED SPARES:**

Keep adequate quantity of following spares at all times.

- Extrusion along with its accessories. (For main and earth)
- Female contact finger along with its accessories. (For main and earth)
- Bus transfer contacts.
- Induced current transfer contact.
- Clevis pins with nylon washers, split pins, brass washers and “C” shims.
- Control springs.



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