

Session: Erection of Pole Mounting Distribution Substation

Learning Objectives	Evaluation Criteria
<ul style="list-style-type: none"> Explain how to erect a Double Pole (DP) structure Describe the accessories and fittings on the DP structure 	Interactive Questioning



Duration 30 Minutes



Resources PowerPoint Presentation, Markers and White Board



Facilitator's Notes Show videos and visuals to educate participants about the process of erecting a double pole structure, its accessories and fittings.

End of Note



1. Tell:
Welcome to the session on 'Erection of Pole Mounting Distribution Substation'.



2. Tell:
By the end of this session, you will be able to:

- Explain how to erect a Double Pole (DP) structure
- Describe the accessories and fittings on the DP structure



Tell:
Before we proceed, let me ask you a few questions.

Ask:
How many of you have worked on setting up of a substation?

Facilitator's Notes:

- Most of the participants may raise their hands
- Direct the next question to them
- Inform those who have not raised their hands that they will learn about the process in this session

Ask:
Can one of you list the steps followed in erection of the substation?

Facilitator's Note:
Appreciate the responses.

Ask:

Can you name some of the accessories required to erect a DP-mounted substation?

Possible Responses:

- Cross arms
- Pin insulators
- Hampers

Facilitator's Notes:

- There may be other accessories
- Read the names in the next slide
- Note down all the accessories given in the next slide on the whiteboard
- Encourage the participants to take part in the discussion

Tell:

Well tried! There are certain additional steps other than those mentioned by you. There are also other accessories that are involved in the erection process.

In this session, we will watch a few video clips and learn the various processes involved in erection of a substation.

Let us begin by looking at the required accessories.

**3. Facilitator's Note:**

Click to play the video.

Ask:

What have you observed?

Possible Responses:

- Images of cross arms
- Pictures of pin insulators
- Images of GO switches

Tell:

Here, we can see the images of cross arms and different types of channels. These items are fitted into the DP structure when the complete frame is fixed.

**4–
5. Tell:**

Next, we can see the pin insulators that are fitted on the top hampers and cross arms. Here, we see all types of channels and top hampers including all sizes of MS clamps.

These are the complete GO switch unit accessories. They include three GO switch units, GO switch handle and the GO switch pipe.

**Ask:**

You have seen the various accessories. Can any one of you describe the first step of the erection process?

Facilitator's Note:

Appreciate the responses and proceed.

Tell:

Let us watch this video clip.



6–
12.

Facilitator's Note:

Click to play the video.

Tell:

Setting up of the DP structure begins with clamping and wiring of pin insulators. This is done in the following manner.

1. **Climbing up the pole:** The lineman must climb up the pole with the help of a ladder. After he reaches the top of the pole, he must tie the top end of the ladder to the pole with the help of a rope. This is a safety aspect that every lineman must follow. Otherwise, the lineman will be at the risk of falling off the ladder.
2. **Fixing the cross arms:** The next step is to fix the cross arms on the pole. The cross arms are tied with a rope and transported to the lineman by the ground staff. The lineman must be very careful while taking and fixing the cross arms as he is working at a height. He must take care of this aspect by fixing the safety hooks of full body harness on the line.
3. **Shorting chain clips:** After the cross arm is fixed, the lineman stands on the cross arm and wears a safety rope, which is called jhola. He then connects the shorting chain clips with the earth wire line.
4. **Fitting V cross arm:** The V-shaped cross arm is fixed as any other cross arm.
5. **Fixing of top hamper:** After fixing the V-shaped cross arm, the lineman fastens the safety hooks of full body harness, as mentioned earlier, to fix the top hamper and D-clamp channel on the top of the pole. Then, he fixes the pin insulator on the channel of D-clamp at the top of the pole.
6. **Tightening of pin insulator screw:** After the D-clamp is fixed, he tightens the pin insulator screw. This is followed by fitting and tightening of the MS angle between the poles with clamps. The same procedure is followed for the other pin insulators.
7. **Placing the HT wire and fixing it:** The High Tension or HT wire lines are placed over the pin insulators. They are then tightened with 10 SWG aluminium wires over the groove of the pin insulator.

Let us now quickly recollect what we have learnt so far.

- Fit the two cross arms, so that you can comfortably stand along with your safety belts
- Mount the top hampers
- Fit the V-shaped cross arms and channels
- Fit the three pin insulators on each pole – one is to be present on the top of the pole and two on either side of the pole, as seen



Ask:

Can we start supplying power after fitting the pin insulators and wire?

Possible Responses:

- Yes
- No

Ask:

To those of you who said ‘yes’, can you give reasons for your answer?

Ask:

To those of you who answered ‘no’, can you give reasons for your answer?

Facilitator’s Notes:

- Do not inform the participants whether they are correct or incorrect
- Instead, ask them reasons and let them understand why they are incorrect

Possible Responses:

- Chances of short-circuit are more if earthing is not there
- Earthing is thus essential before power can be supplied

Tell:

That’s right! You need to take care of earthing before power can be supplied.

Let us next learn how to take care of earthing or grounding.



13. Facilitator’s Note:

Click to play the video.

Tell:

To take care of earthing or grounding of the structure, five earth pits are dug at the base. Two earth leads come out from each electrode in these pits. There will be ten leads for the entire structure.

Double earths are provided to the transformer body. Similarly, double earths are also provided in the transformer neutral. One independent earth is provided to ensure that the lightning is arrested.

Ask:

Is the structure now ready for power supply? Give reasons for your answer.

Possible Response:

No, there is connectivity between the transformer and the wires.

Tell:

Well answered! Connectivity is very important for the normal functioning of any substation. Let us next look at the video clip, which explain this concept.



14–16. Facilitator’s Note:

Click to play the video.

Tell:

Three pin insulators are fitted and wound at the top of the structure with HT lines.

These lines are then connected through wedge clamps. Three leads that come down are connected with GO switches. Below these switches are located the drop-down fuses along with barriers.

Lightning arrestors are also fitted below the GO switches. These arrestors protect

the system from surge or lightning fault current.

The transformer is mounted below the DP structure channel. After HT leads are connected to the transformer, LT leads are connected below the LT Aerial Bunch Cable.

Ask:

What do you think are some of the safety precautions to be taken?

Facilitator's Note:

Capture and appreciate the responses.

Tell:

Let us watch this video to know the safety precautions to be taken after the transformer is mounted on the structure.



**17–
18. Facilitator's Note:**

Click to play the video.

Tell:

The following are the safety precautions to be taken during substation erection.

An anti-climbing device and a danger plate are fitted three metres above the ground on both sides of the transformer to prevent unauthorised persons from climbing on to the structure.

The word, 'Danger' should be written both in English and local languages. The status of the line voltage, which is mandatory to be displayed, should be mentioned as per the CEA safety measures requirement. In this case, it is mentioned as 11,000 volts.

All the earth leads are connected with the equipment separately, such as transformer, GO switch, complete structure and an independent earth for the lightning arrester.

The DP structure is finally surrounded by MS fencing to prevent unauthorised entry. Another important thing is that this fencing is not connected to the five earths inside the DP structure. It has a separate independent earthing connection, so that there is zero potential for any leakage from inside the structure.

The fencing is also locked and danger plate is displayed publicly with details of the area and the zone to which it is related.

The danger plate is put up to let the public know that this is a danger zone. It also informs the public that entry without permission is prohibited.

With this, we have seen the process of setting up a distribution substation.

Key Learning Outcomes



19. Tell:

Let us now do a quick recap of what we learnt in this unit.

- Cross arms and different types of channels are fixed to the DP structure when the complete frame is fit
- The lineman first fits two cross arms, so that he can stand comfortably with safety belts and then mount the top hampers
- The top hampers are fitted with 'V' cross arms and channels

- Three pin insulators will be fitted and wound at the top of the structure with HT lines
- The HT lines will be connected through wedge clamps
- DP structure will be surrounded by MS fencing to prohibit unauthorised entry
- MS fencing will not be connected to the five earths of the inside DP structure

Glossary

10 SWG Aluminium Wires: 10 Standard Wire Gauge Aluminium Wires

GO Switch units: Gang Operated Switch Units

MS Clamps: Mild Steel Clamps