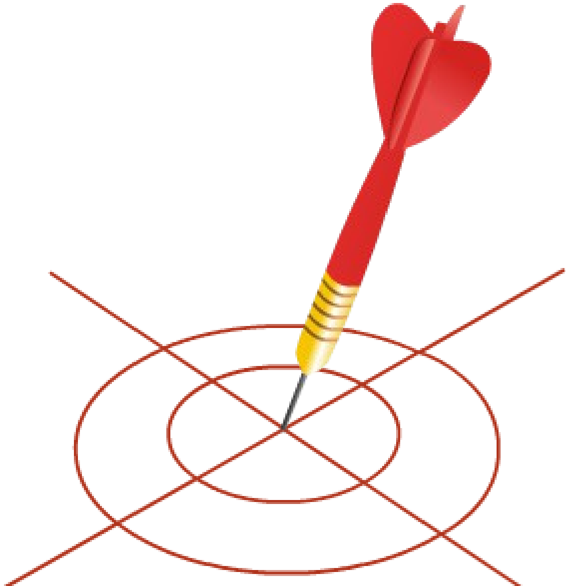
Welcome to the Session on

“LT Distribution Network”

Learning Objective

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

•Explain the LT distribution network breakdown maintenance – possible faults, their identification and rectification



Introduction

- The team will go to the house of the complainant and check if there is really no supply
- They first check the display in BSES meter
- If they notice there is no light in the display of energy meter, the team will check on the pole or underground cable or check the service line

Fault Identification and Rectification at Consumer's Premises

Check the incoming service line by opening the meter box

Check the availability of supply at MCB terminals

Fault Identification and Rectification at Consumer's Premises

Rat dung on the base plate of meter box

Neutral is missing as rats have cut the neutral wires

Fault Identification and Rectification at Consumer's Premises

Checking the availability of supply at meter board

Showing the availability of supply up to the MCB from meter terminal

Fault Identification and Rectification at Consumer's Premises

Bus bar box, where service line is connected from the meter

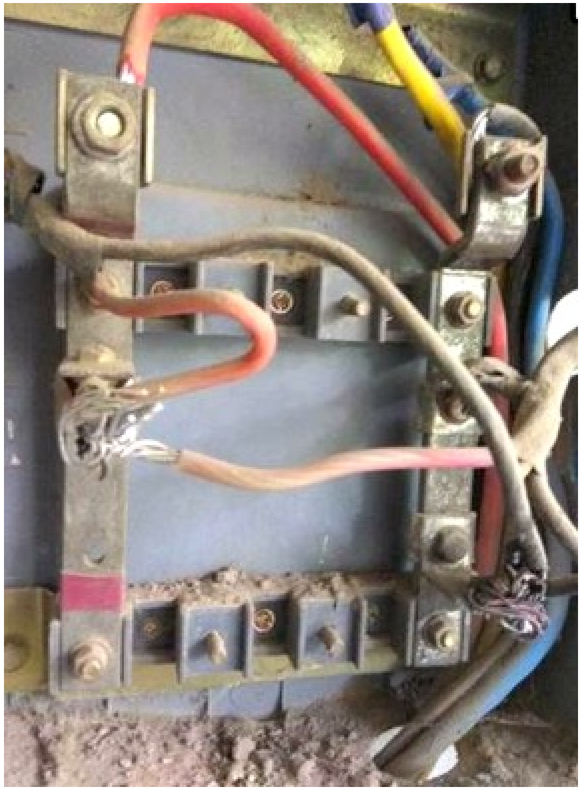
Loose connections and temporary joints in bus bar box

Fault Identification and Rectification at Consumer's Premises

Bus bar strips are missing

Overheated and damaged outgoing leads

Fault Identification and Rectification at Consumer's Premises

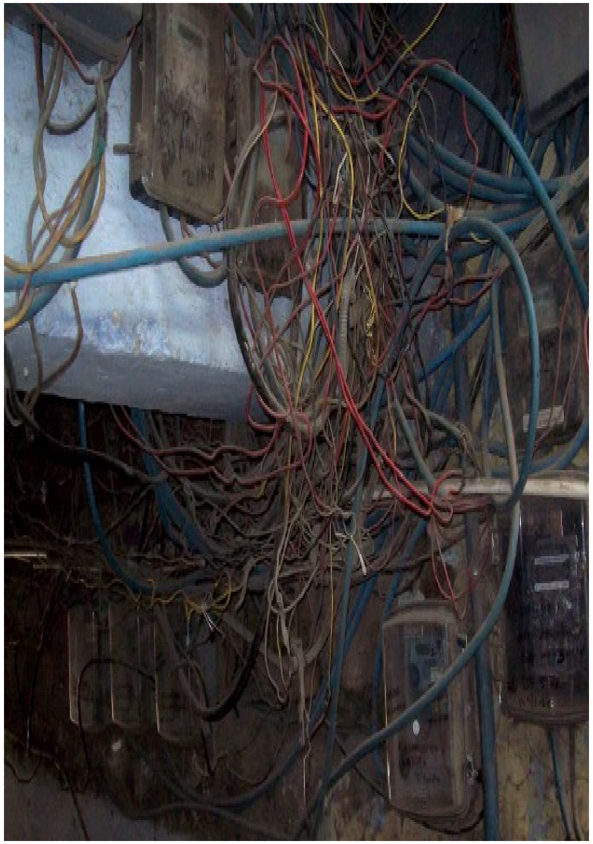


Supply missing from bus bar boxes

Loose joints in incoming service line

Fault Identification and Rectification at Consumer's Premises

Jumbling of service lines and excessive stress on pole



Fault Identification and Rectification at Consumer's Premises

Bad condition of wiring for attending 'Fuse call' or 'No current complaint'

Defective Meter Cases

Defective meters, where consumer's supply is affected

Defective Meter Cases

Examples of smoke and black soot seen at the meter terminal

Defective Meter Cases

Examples of the cases, where the meter is burnt

Defective Meter Cases

Completely damaged metering equipment due to heavy flash accompanied by fire in the meter box

Defective Meter Cases

Completely damaged metering equipment due to heavy flash accompanied by fire in the meter box

Corrective Measures

- Instead of making temporary joints to restore the consumer's supply from the bus bar, ensure that there are firm and tight connections with sockets
- There should be no jumbling of wires, as loose and temporary connections are the major cause for any breakdown

Corrective Measures

- Energy meters must be installed in a row with clear and distinct gaps
- Both incoming and outgoing cables should be properly saddled with clear visibility from their feeding points
- Meter terminals need to be tightly connected and covered with seal, with no joints within the incoming cable

Corrective Measures

Corrective Measures

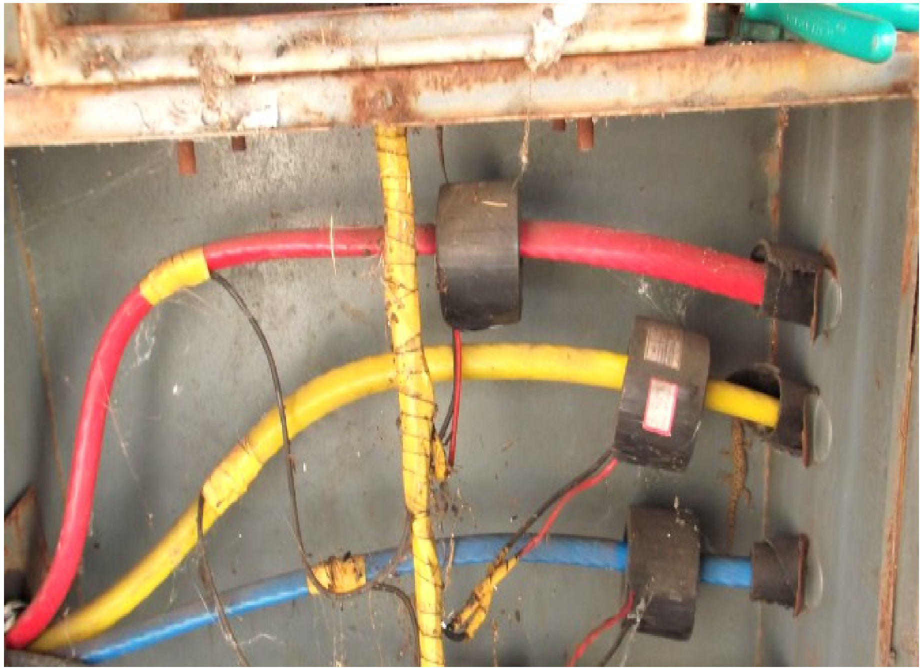
- Pole mount distribution boxes are commonly used to avoid too many service lines from a single pole getting jumbled
- Here two distribution boxes have been fitted on the pole
- Usage of a service cable anchor not only reduces stress on the cable but also reduces extra length and jumbling of the cable at the top of the pole

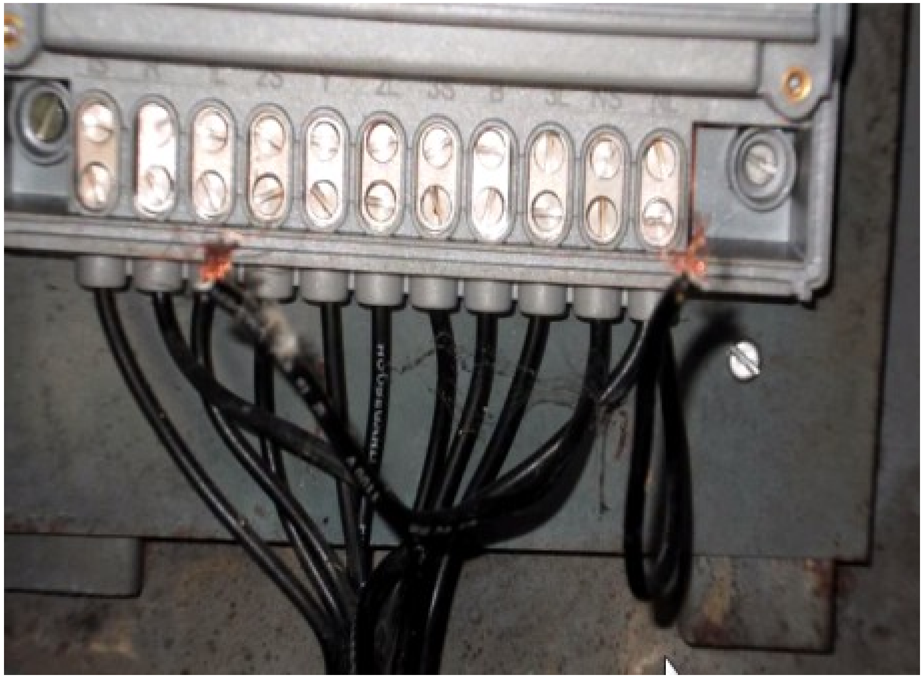
Corrective Measures

Clamped service cable up to the meter box

Replacing control wire of the meter

Corrective Measures





M-seal is applied to avoid entry of reptiles from the cable entry point

Corrective Measures

Restoration of consumer's supply

Clean and tidy wiring

Repairing of Service Cable at Consumer Premises

Lineman repairing the LT service cable

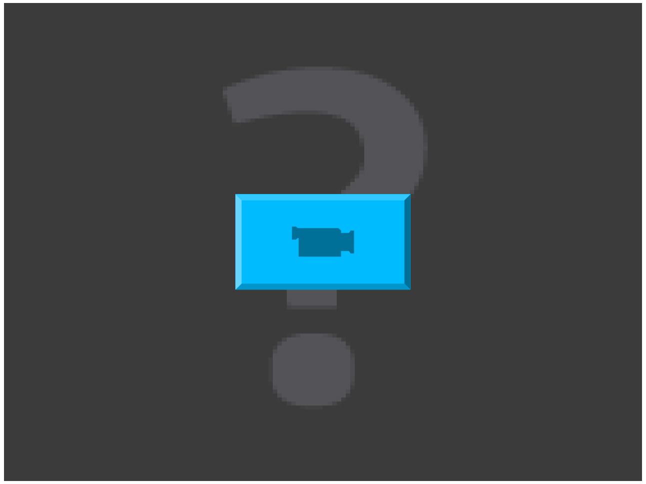
- Before a new service line can be laid to a consumer premises, a TCR (Temporary Current Restored) is prepared by breakdown staff
- This is done by tapping at the insulation tape on the damaged portion of the service line cable lead

Repairing of Service Cable at Consumer Premises

- If the service line is in a good condition, check the MCB of the consumer
- MCB is checked thoroughly to know whether there is a fault in the input terminal or outgoing terminal
- If the fault is in input terminal, then check it thoroughly, repair it and provide supply to the consumer
- If the fault is in the outgoing terminal of the MCB, the fault will be at the consumer end; consumer informed accordingly
- The consumer will have to get the fault rectified

Complaint Regarding Power Failure in Entire Area

- Power failure in the whole area is the fault from supplier's end; could be a major one
- It can be classified as force majeure – due to natural calamities like storm, floods, earthquakes…
- Other reasons could be short circuit by birds (birdage), electric pole hit by a vehicle or someone damaging the underground cable during digging



Breakdowns due to Natural Disasters

LT lines are damaged due to a storm

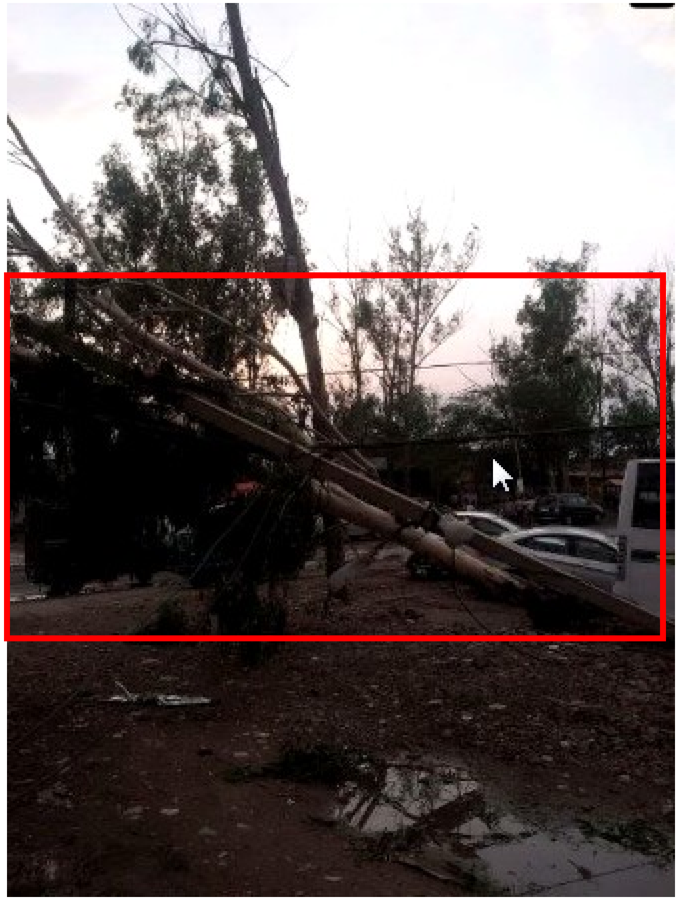
Temporary barricade is made with the help of a van

Breakdowns due to Natural Disasters

Communication tower uprooted due to a storm

Tree has fallen on the LT lines

Breakdowns due to Natural Disasters



Uprooted LT PCC pole

An airplane has landed in an urban area damaging the electric lines

Breakdowns due to Natural Disasters

Tree has fallen on the LT line

LT PCC pole hit by a vehicle

Power Supply Restoration

Erection of new poles

Laying of new LT lines to restore the supply

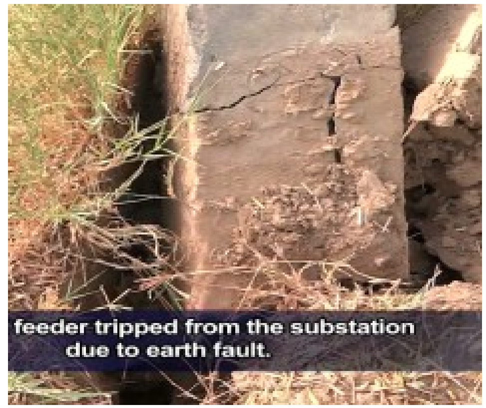
Removal of uprooted trees with the help of a crane

Lifting of broken tree with the help of a crane

Lifting and removal of branches with a crane

Power Supply Restoration

Broken and uprooted LT PCC pole



Tripped LT feeder

Power supply should be restored within six hours

Carrying LT poles on a pole cart

Power Supply Restoration

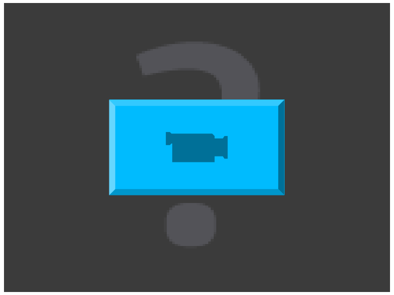
- If no current complaint is received for a whole area, we check the ACB and then do area patrolling
- During area patrolling, we first check the overhead lines to see if there is any fault
- If any fault is found in the line, we rectify it and close the complaint
- The complaint will be closed after the ACB is on and supply for the whole area is restored to normal
- If there is repeated tripping due to overload or short circuit, functioning of the ACB becomes weak, resulting in damage, flashing and so on
- In such cases, the breakdown personnel bypass the burst ACB
- They then try to restore the supply and take up the task of replacing the old ACB with a new one

Power Supply Restoration

LT switch-board panel

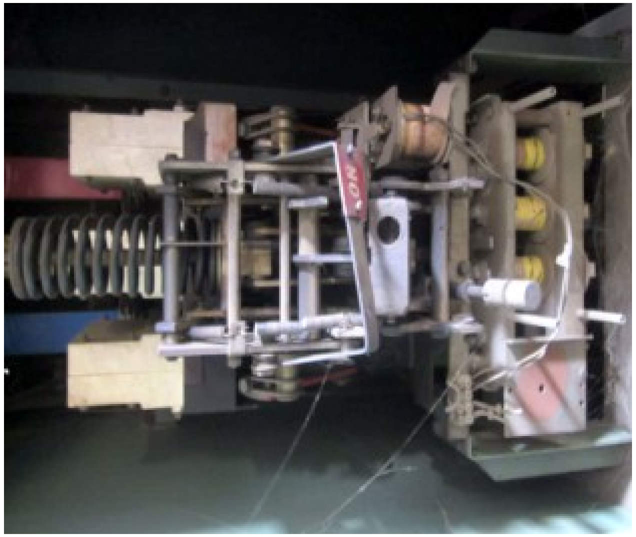
Waste scrap in front of the panel

LT switch gear



Power Supply Restoration

Components of panel about to collapse



LT switch gear being a safety hazard

LT panel replaced with new ACB

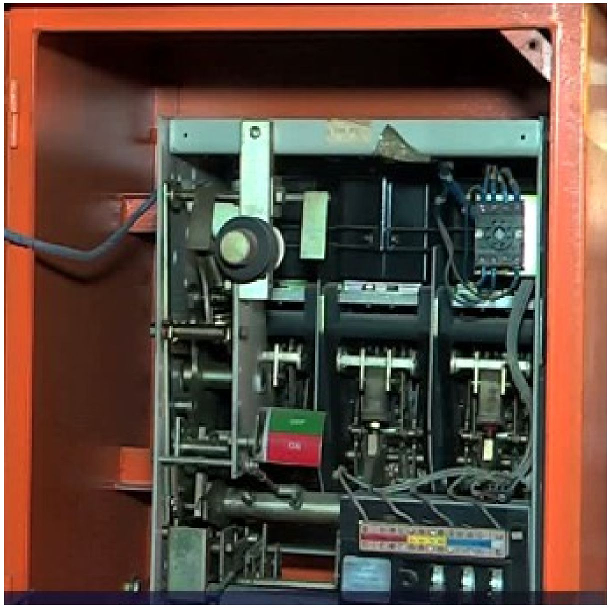
Comparison Between Old and New Panels

Old Panels
Displayed here are the old bulky panels.
There is only one LT main switchgear, with one incoming line from the transformer LT side and three outgoing feeders; one of them is faulty.
Repairing the LT bus is a tough task because of non-availability of obsolete accessories.
Moreover, repairing it takes a lot of time and there is very low reliability even after the repair.

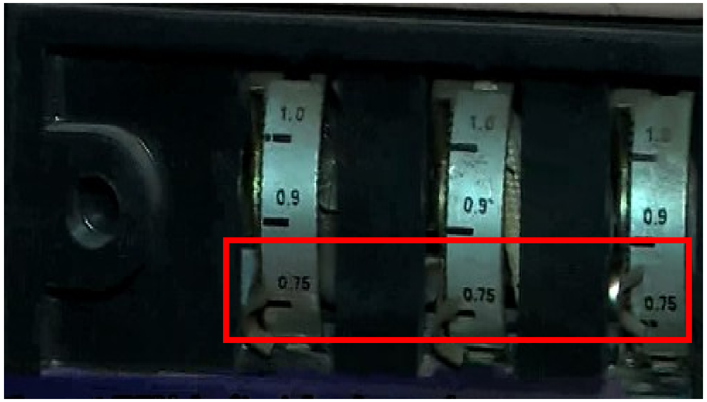
Comparison Between Old and New Panels

Old feeders are replaced with a new ACB

Energising the ACB

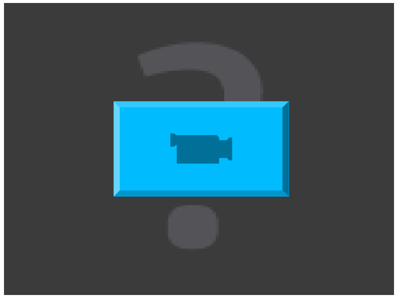


LT ACB of 400 amperes



Setting at 75% in tripping relays

Arc chamber is washed with CRC



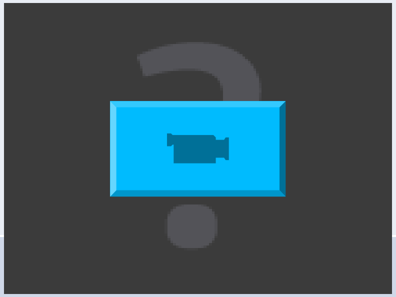
Complaint Regarding Power Failure in LT Main

Fault in the LT Main

If the frequency of complaints increases in an area, check the LT main for the second time and patrol the area.

There are three types of LT mains in general, depending on the distribution transformer capacity. They are:

- 400 KVA
- 630 KVA
- 990 KVA



In 400 KVA transformers, 800-ampere LT main is installed.

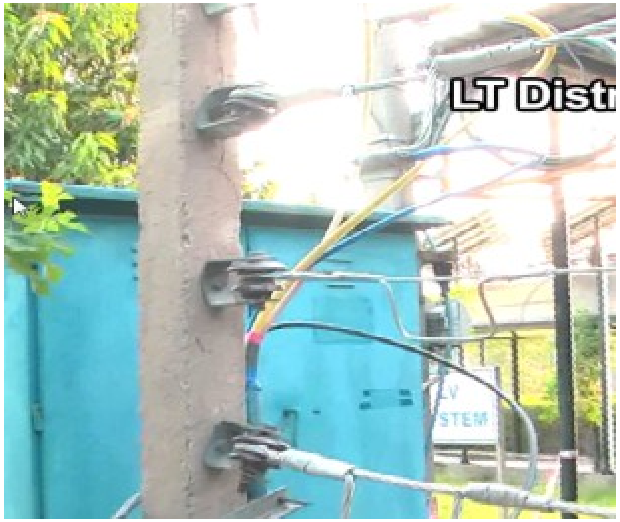
In 630 KVA transformers, 1250-ampere LT main is installed and in 990 KVA transformers, 2000-ampere LT main is installed.

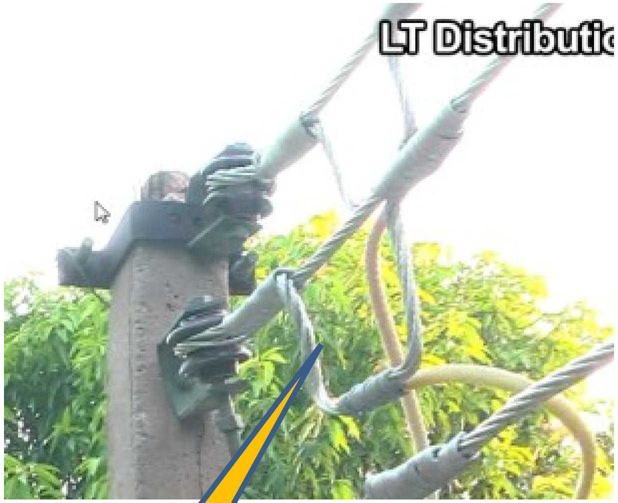
The LT main setting is done at 80% to avoid overloading.

If a fault arises in this condition, patrol the area to check for unbalanced load, birdage, snapping of jumpers, breaking of neutral and so on.

Most of these complaints are due to neutral breakdown. In that case, check the neutral, connect it properly and also connect it properly to the jumper. Then, go to the sub-station and switch on the LT main.

LT Overhead Network



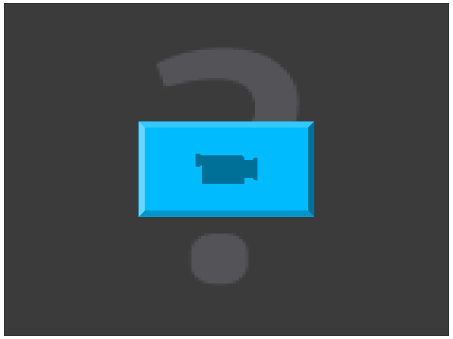


ACSR conductor lines

Under three conductors are phase lines

Low-size conductor for street light – 4th conductor

D-clamps



LT Overhead Network

Neutarl conductor, the 5th one

GI wire, which guards all the wires above

LT Overhead Network

- Each ACSR conductor is connected with an extension loop called Ghori
- All the inter-linked connections to the lines are made from these extension loops
- At the next span, which meets at a ‘T’ point, the connection with jumpers is through the extension loop or Ghori
- These jumpers act as isolation points for each pole line
- The faulty portion of a distribution line can thus be isolated
- All the service connections to the consumers are connected on extension loop
- This is for easy isolation and to ensure that it has the least effect on the main line conductor in case of a fault

LT Overhead Network

LT control panel in a substation

LT main connected from the transformer outgoing

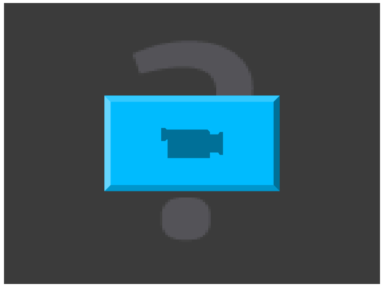
LT Overhead Network

LT control panel in a substation

Outgoing feeder for capacitor bank

Handling Different Types of Complaints

Checking the line condition using multimeter



Checking the line condition using multimeter and clamp ON meter

Checking status of individual line voltage and current

Handling Different Types of Complaints

Display of online status on the multimeter

- In such conditions, area patrolling is done to find out the cause of the complaint
- It may be due to:
  - Unbalanced load
  - Jumper snap
  - Neutral breakdown
  - Phase-to-phase short circuit
  - Blowing out of DD fuse on the HT side of the distribution transformer

Handling Different Types of Complaints

- The engineer checks the phase current with the help of the clamp ON meter
- In case of an unbalanced load, the load in R-Y-B phase should be properly balanced; the current in neutral should ideally be zero
- 20% of total phase current is allowed, however
- In case of unbalanced current, the current flow increases in the neutral and problems arise

Handling Jumper Snap

Jumper Snap Complaint

In case of a jumper snap, one phase will be is missing and there will be excess voltage in another phase – Switch off the LT main immediately, repair the jumper, rectify the problem and switch on the LT main.

Complaint Regarding DD Fuse Blown

In case DD fuse is blown, the voltage in the LT main of that particular phase will become very dim – Switch off the transformer immediately, call the HT breakdown, repair the blown DD fuse and resolve the complaint.

Key Learning Outcomes

- In case of a no current complaint, first check the display in BSES meter
- Check if there is any fault at the premises of the consumer who has made the no current complaint
- Instead of making temporary joints to restore the consumer's supply from bus bar, ensure that there are firm and tight connections with sockets
- Energy meters must be installed in a row with clear and distinct gaps
- Meter terminals should be tightly connected and covered with a seal. There must be no joint in the incoming cable
- Pole mount distribution boxes are commonly used to avoid too many service lines from a single pole and to prevent jumbling of service lines
- Power failure in an entire area can be due to natural calamities, short circuit by birds, electric pole being hit by a vehicle or someone damaging the underground cable during digging

Key Learning Outcomes

- If there is repeated tripping due to overload or short circuit, functioning of the ACB will become weak
- The three types of LT mains as per the distribution transformer capacity are 400 KVA, 630 KVA and 990 KVA
- In case of unbalanced load, the load in R-Y-B phase should be properly balanced and the current in neutral should ideally be zero
- In case of a jumper snap, switch off the LT main immediately, repair the jumper, rectify the problem and switch on the LT main
- In case a DD fuse gets blown, switch off the transformer immediately, call the HT breakdown, repair the blown DD fuse and resolve the complaint