What is the purpose of earthling in electrical installation? Explain different types of electrical earthling.

The primary purpose of earthling is safety, as it provides a low-resistance path for fault currents to flow to the earth, preventing electric shock, fire, and equipment damage by ensuring protective devices operate correctly. Key types of electrical earthling include pipe earthling, where a perforated pipe is buried vertically; plate earthling, using a metal plate buried horizontally; rod earthling, employing a rod driven into the ground; and strip earthling, which uses a copper or aluminum strip.

Purpose of Earthling

- **Protection from Electric Shock:**

  When a fault occurs, the earth wire provides a safe path for the current to flow to the ground, preventing dangerous voltages from building up on exposed metal parts of appliances and equipment.

- **Protection of Equipment:**

  Earthing protects electrical appliances and devices from damage caused by overvoltage or excess current by providing an immediate discharge path for the energy to the earth.

- **Prevention of Fire and Explosions:**

  By ensuring fault currents are safely dissipated, earthing reduces the risk of fire and explosions that could occur from unchecked electrical energy.

- **Voltage Stabilization:**

  It helps to stabilize voltage levels within an electrical system, ensuring consistent and safe operation.

- **Reference Point for Safety Devices:**

  The earth system acts as a crucial reference point for protective devices like fuses and circuit breakers, allowing them to accurately detect faults and switch off the power supply to the affected circuit.

- **Protection Against Lightning:**
  Earthing can also protect buildings from the damaging effects of lightning by providing a discharge path.

Types of Electrical Earthing

The choice of earthing type often depends on factors like soil resistivity, space availability, and moisture content.

- **Pipe Earthing:**

  A galvanized steel perforated pipe, either round or square, is buried vertically in the ground. The pipe is filled with charcoal and salt to improve conductivity and moisture retention, connecting the electrical conductors to the earth.

- **Plate Earthing:**

  This method uses a horizontal metal plate, typically made of cast iron or copper, buried in the ground. The plate is connected to the electrical system via a conductor and a nut and bolt.

- **Rod Earthing:**

  A galvanized steel or copper rod is driven vertically into the earth, connecting the electrical installation directly to the ground.

- **Strip Earthing:**

  A copper or aluminum strip, or a wire of suitable cross-section, is laid in trenches in the ground. The ends are connected and extended to the earthing lead.

- **Marconite Earthing:**
  A specialized product consisting of a mixture of aggregates and binding agents, Marconite is used as a backfill around an earthing electrode to enhance its performance, especially in areas with high soil resistivity.

https://circuitglobe.com/electrical-earthing.html

Write short note on MCCB. MCB

A moulded case circuit breaker (MCCB) is a type of electrical protection device that is used to protect the electrical circuit from excessive current, which can cause overload or short circuit. With a current rating of up to 2500A, MCCBs can be used for a wide range of voltages and frequencies with adjustable trip settings. These breakers are used instead of miniature circuit breakers (MCBs) in large scale PV systems for system isolation and protection purposes.

How the MCCB operates

The MCCB uses a temperature sensitive device (the thermal element) with a current sensitive electromagnetic device (the magnetic element) to provide the trip mechanism for protection and isolation purposes. This enables the MCCB to provide:

- Overload Protection,
- Electrical Fault Protection against short circuit currents, and
- Electrical Switch for disconnection.

Overload Protection

Overload protection is provided by the MCCB via the temperature sensitive component. This component is essentially a bimetallic contact: a contact which consists of two metals that expand at different rates when exposed to high temperature. During the normal operating conditions, the bimetallic contact will allow the electric current to flow through the MCCB. When the current exceeds the trip value, the bimetallic contact will start to heat and bend away due to the different thermal rate of heat expansion within the contact. Eventually, the contact will bend to the point of physically pushing the trip bar and unlatching the contacts, causing the circuit to be interrupted.

The thermal protection of the MCCB will typically have a time delay to allow a short duration of overcurrent which is commonly seen in some device operations, such as inrush currents seen when starting motors. This time delay allows the circuit to continue to operate in these circumstances without tripping the MCCB.

Electrical Fault Protection against short circuit currents

MCCBs provides an instantaneous response to a short circuit fault, based on the principle of electromagnetism. The MCCB contains a solenoid coil which generates a small electromagnetic field when current passes through the MCCB. During normal operation, the electromagnetic field generated by the solenoid coil is negligible. However, when a short circuit fault occurs in the circuit, a large current begins to flow through the solenoid and, as a result, a strong electromagnetic field is established which attracts the trip bar and opens the contacts.

Electrical Switch for disconnection

In addition to tripping mechanisms, MCCBs can also be used as manual disconnection switches in case of emergency or maintenance operations. An arc can be created when the contact opens. To combat this, MCCBs have internal arc dissipation mechanisms to quench the arc.

https://www.gses.com.au/molded-case-circuit-breakers/