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Electrical Earthing or Grounding Concept

The earthing or grounding of an electrical system plays a very important role for the stability and safety operation of the system. Though the earthing or grounding in electrical system is always invisible by physically & by its function but we can feel its importance only with the problems in electrical system with poor or no earthing system.

Electrical Earthing or Grounding

Earthing or grounding system is an electrical circuit which connects a part of electrical system to the earth or ground.

What is earth & ground

Earth: The conductive mass of the Earth, whose electric potential at any point is Conventionally taken as zero

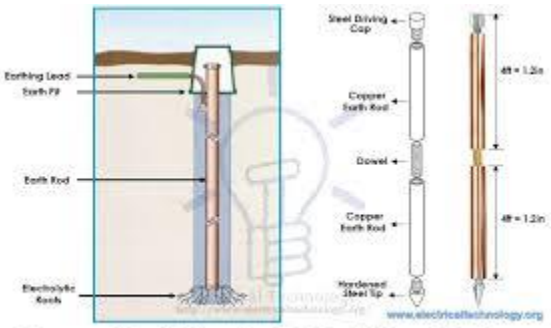
Ground– A conducting connection, whether intentional or accidental, by which an electric circuit or equipment is connected to the earth or to some conducting body of relatively large extent that serves in place of the earth.

So ground refers to the equipment grounding system, Such as metallic raceways, cable armor, enclosures, cabinets, frames, building steel, and all other non-current carrying metal parts of the electrical distribution system.

Why earthing or grounding is needed

The main aim of earthing is to maintain a zero potential or zero voltage of all non-current carrying parts of electrical system which has the probability of electrified by some fault. If by some means the non-current carrying parts are electrified which is not earthed, the person touching it will receive a lethal shock.

So by earthing the non-current carrying parts are connected to earth and maintained at earth potential. It also prevents static charge buildup. Also the earthing is used to release the fault current from the electrical system, which are describe below in the section of types of earthing.



Copper Rod Electrode Earthing System

Objectives of earthing or grounding

- To provide means to carry electric currents into the earth under normal and fault conditions without exceeding any operating and equipment limits or adversely affecting continuity of service.
- To assure that a person in the vicinity of grounded facilities is not exposed to the danger of critical electric shock.
- Fixing the potential of live conductors with respect to the earth in normal operation,
- Limiting voltage between the non-current carrying parts in electrical system (such as frames of electrical equipment) and the earth should an insulation fault occur.
- Implementing protection devices which remove the risk of electric shocks or electrocution of person;
- In low voltage network limiting rises in potential due to Medium Voltage faults.

Types of earthing or grounding system: by function

Equipment Grounding:

In equipment grounding system all non-current carrying metal parts are interconnected and then connected to the earth. This way firstly there is no potential or voltage between the non-current carrying metal parts and then secondly there is no potential difference between the earth and non-current carrying metal parts. Non-current carrying metal parts are such as- panel or enclosure body, metal race way, cable channel, equipment body or frame.

System grounding:

In system grounding a current carrying conductor is intentionally connected to earthing system grounded. This intentionally earthed current carrying conductor is called Grounded conductor.

The neutral of Low voltage side of transformer and the stator of generator is the example of system grounding.

Though most of the time the grounded conductor are not carrying current but as per the international code these have to be treated same as the live conductor. That is the precautions, insulation; handling will be same as that of the phase or live conductor.
In system grounding for the fault current there is low impedance return path from the load to the source, thus fault clearing is done and also ground fault protection system can be initiated.

Is it safe to touch any grounded object?

People often assume that any grounded object can be safely touched. A low substation ground resistance is not, in itself, a guarantee of safety. There is no simple relation between the resistance of the ground system as a whole and the maximum shock current to which a person might be exposed. Therefore, a substation of relatively low ground resistance may be dangerous, while another substation with very high resistance may be safe or can be made safe by careful design.