

## Concept of Electrical Earthing or Grounding

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.

Or in other words, To connect the metallic (conductive) Parts of an Electric appliance or installations to the earth (ground) is called **Earthing** or **Grounding**.

### *Difference between Earthing, and Grounding*

**Earthing** and **Grounding** are the same terms used for Earthing.

**Grounding** is the commonly word used for Earthing in the **North American** standards like **IEEE, NEC, ANSI** and **UL** etc while,

**Earthing** is used in **European**, Common wealth countries and *Britain standards like IS and IEC* etc.

As per **IEEE standard 80:2000**-“**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.”

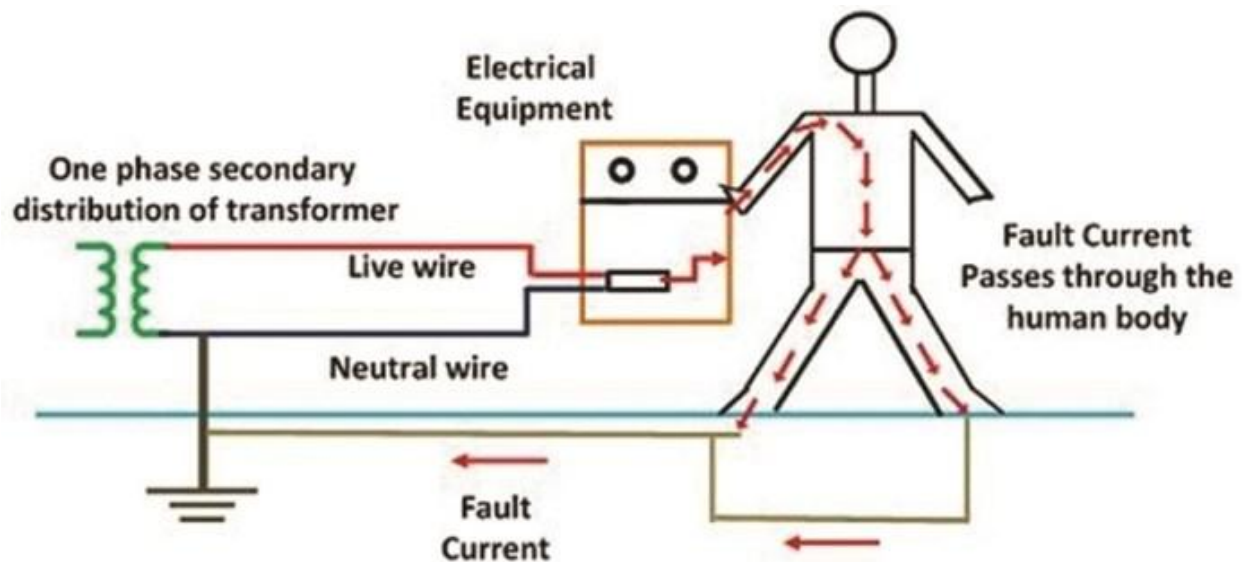
As per **IEC 60364- Earth**: The conductive mass of the Earth, whose electric potential at any point is Conventionally taken as zero

### Need of earthing or grounding:

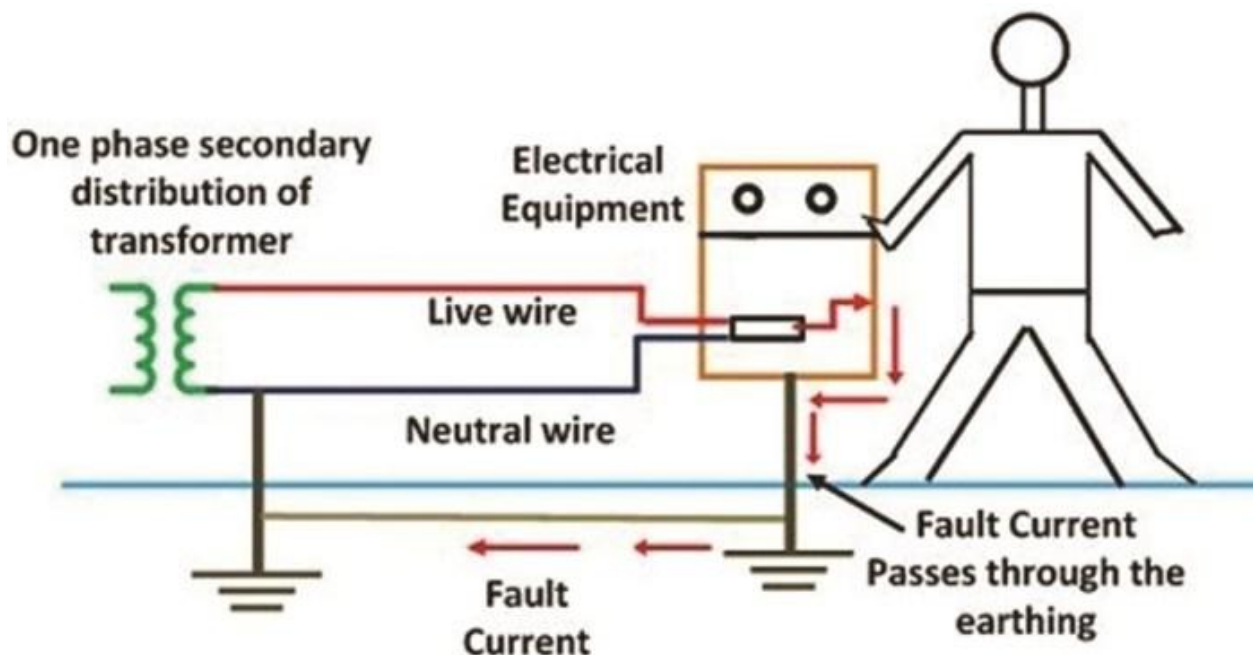
The primary purpose of earthing is to avoid or minimize the danger of electrocution, fire due to earth leakage of current through undesired path and to ensure

that the potential of a current carrying conductor does not rise with respect to the earth than its designed insulation.

When the metallic part of electrical appliances (parts that can conduct or allow passage of electric current) comes in contact with a live wire, maybe due to failure of installations or failure in cable insulation, the metal become charged and static charge accumulates on it. **If a person touches such a charged metal**, the result is a severe shock. (as shown in the diagrams below:



To avoid such instances, the power supply systems and parts of appliances have to be earthed so as to transfer the charge directly to the earth. *This is why we need Electrical Earthing or Grounding* in electrical installation systems.



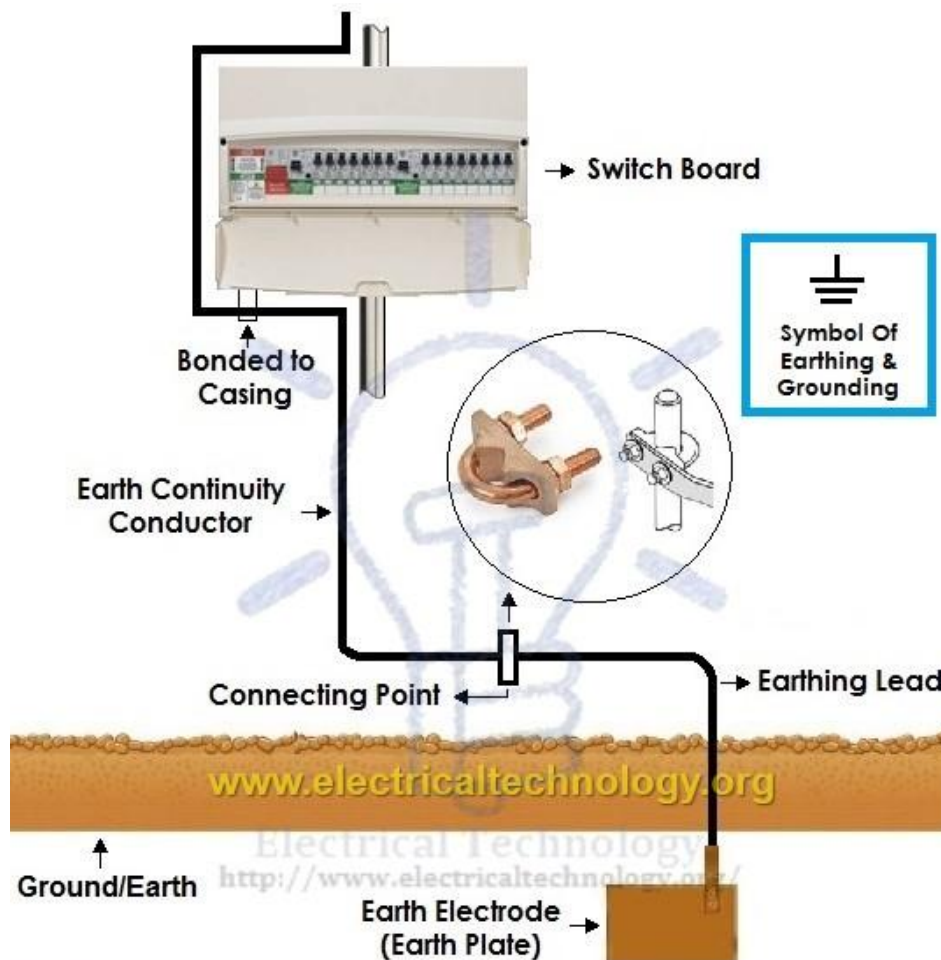
***Below are the basic needs of Earthing.***

- To protect human lives as well as provide safety to electrical devices and appliances from leakage current.
- To keep voltage as constant in the healthy phase (If fault occurs on any one phase).
- To Protect Electric system and buildings form lightning.
- To serve as a return conductor in electric traction system and communication.
- To avoid the risk of fire in electrical installation systems.

## Components of Earthing System

A complete electrical earthing system consists on the following basic components.

- ***Earth Continuity Conductor***
- ***Earthing Lead***
- ***Earth Electrode***



**Components of an Earthing/Grounding System**

## *Earth Continuity Conductor or Earth Wire*

That part of the Earthing system which interconnects the overall metallic parts of electrical installation e.g. conduit, ducts, boxes, metallic shells of the switches, distribution boards, Switches, fuses, Regulating and controlling devices, metallic parts of electrical machines such as, motors, generators, transformers and the metallic framework where electrical devices and components are installed is known as earth wire or earth continuity conductor as shown in the above fig.

The resistance of the earth continuity conductor is very low. According to IEEE rules, resistance between consumer earth terminal and earth Continuity conductor (at the end) should not be increased than  $1\Omega$ . In simple words, **resistance of earth wire should be less than  $1\Omega$** .

## *Earthing Lead or Earthing Joint*

The conductor wire connected between earth continuity conductor and earth electrode or earth plate is called Earthing joint or “Earthing lead”.

## *Earthing Electrode or Earth Plate*

A metallic electrode or plate which is buried in the earth (underground) and it is the last part of the electrical Earthing system. In simple words, the final underground metallic (plate) part of the Earthing system which is connected with Earthing lead is called earth plate or earth electrode.

## **Types of Electrical Earthing**

Earthing can be done in many ways. The various methods employed in Earthing (in house wiring or factory and other connected electrical equipment and machines) are listed as follows.

- a. *Plate Earthing*
- b. *Pipe Earthing*
- c. *Rod Earthing*
- d. *Earthing through the Waterman*
- e. *Strip or Wire Earthing*

