

1. What is Earthing ?

2. Types of Earthing

What is Earthing?

- To connect the metallic (conductive) Parts of an Electric appliance or installations to the earth (ground) is called Earthing or Grounding.



Need of Earthing or Grounding.

Why Earthing is Important?

- 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.
- 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.

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 from lightning.
- To serve as a return conductor in electric traction system and communication.
- To avoid the risk of fire in electrical installation systems.

POINTS TO BE EARTHED....

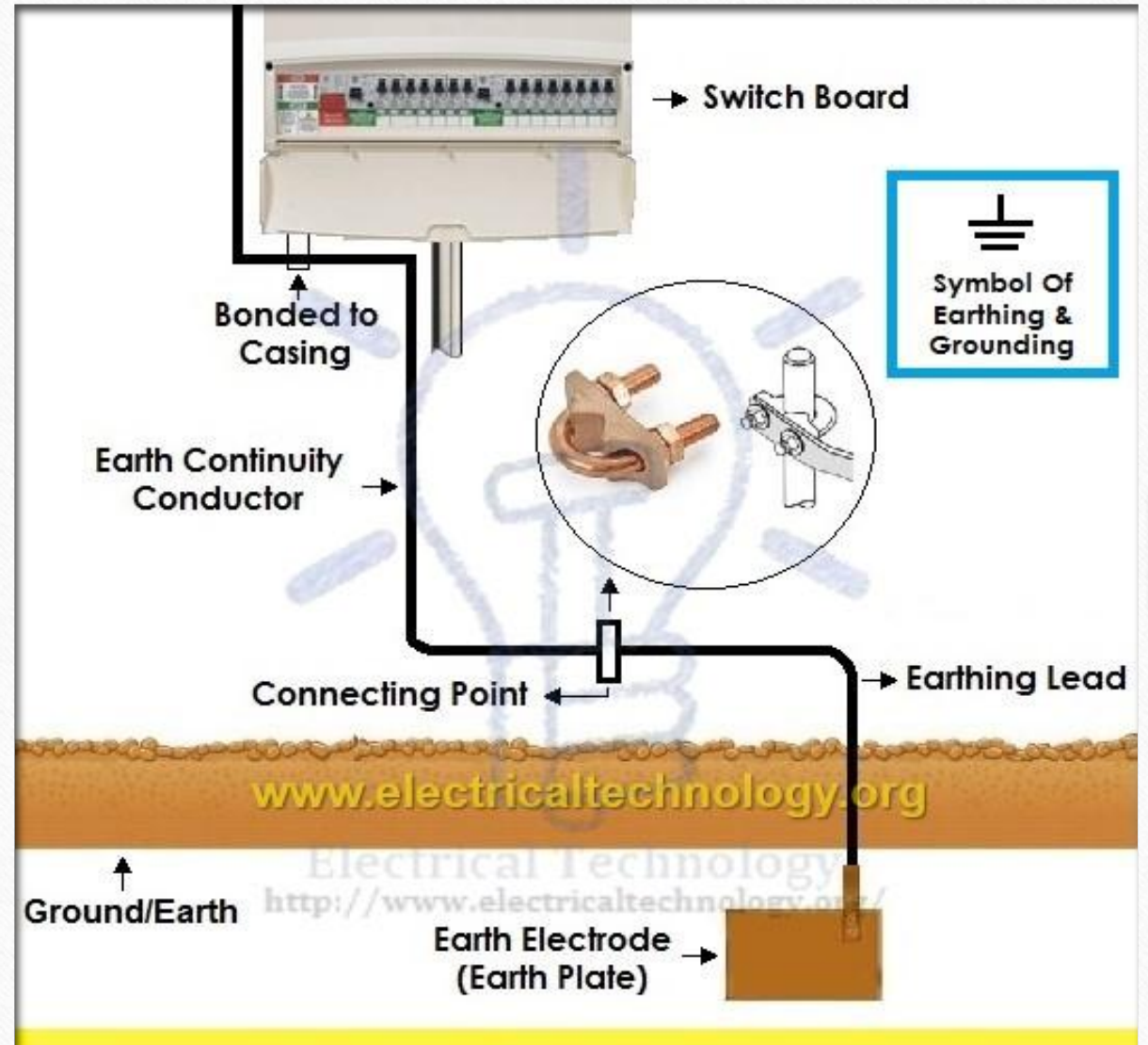
- **Earth pin of 3-pin lighting plug sockets and 4-pin power plug should be efficiently and permanently earthed.**
- **All metal casing or metallic coverings containing or protecting any electric supply line or apparatus such as GI pipes and conduits enclosing VIR or PVC cables, iron clad switches, iron clad distribution fuse boards etc.**
- **The frame of every generator, stationary motors and metallic parts of all transformers used for controlling energy should be earthed.**
- **In a dc 3-wire system, the middle conductors should be earthed at the generating station.**
- **Stay wires that are for overhead lines should be connected to earth by connecting at least one strand to the earth wires.**

Components of Earthing System

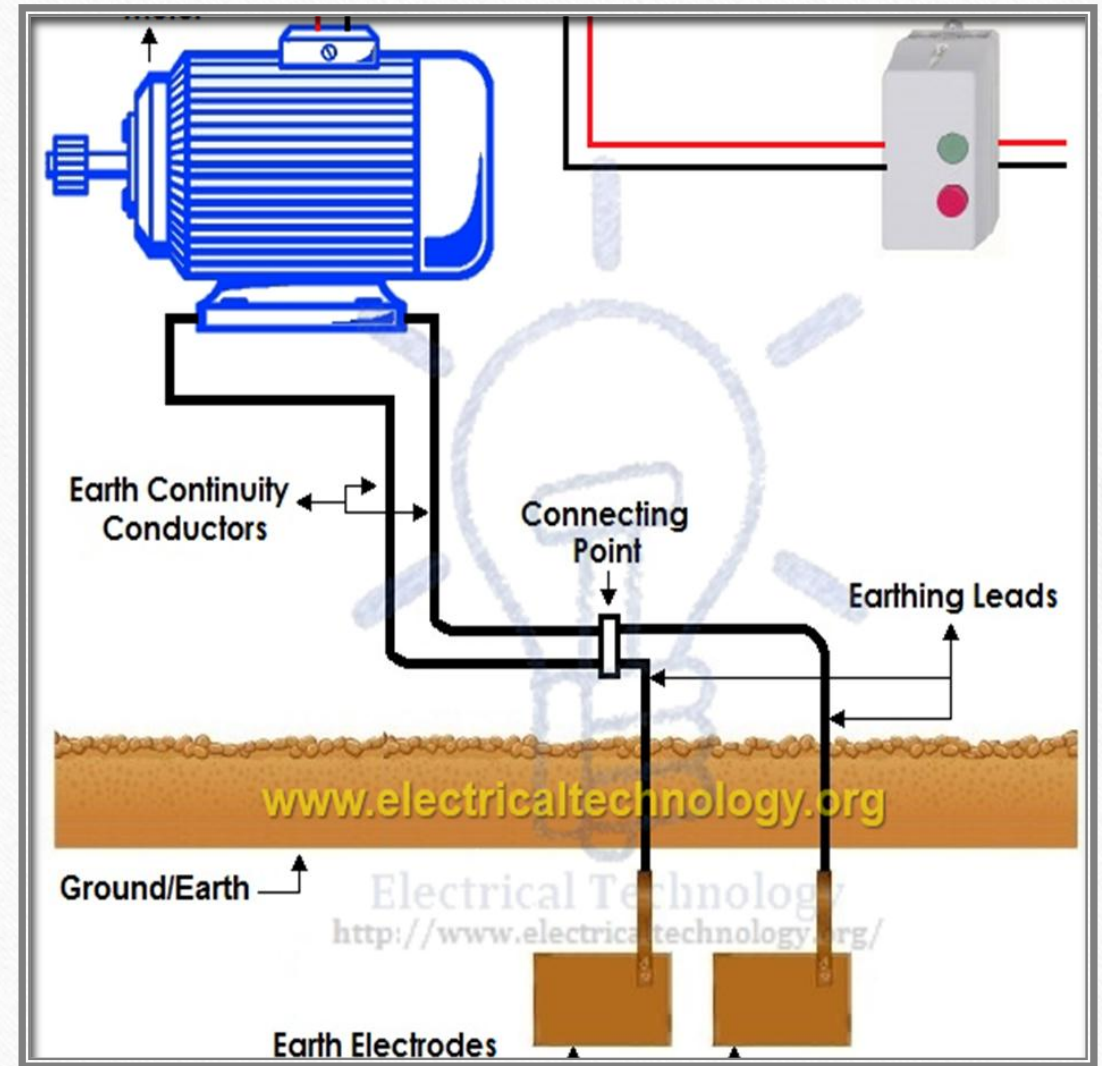
Earth Continuity Conductor

Earthing Lead

Earth Electrode



Earthing of Single Motor from Two Places



Types of Earthing ?

1). Plate Earthing

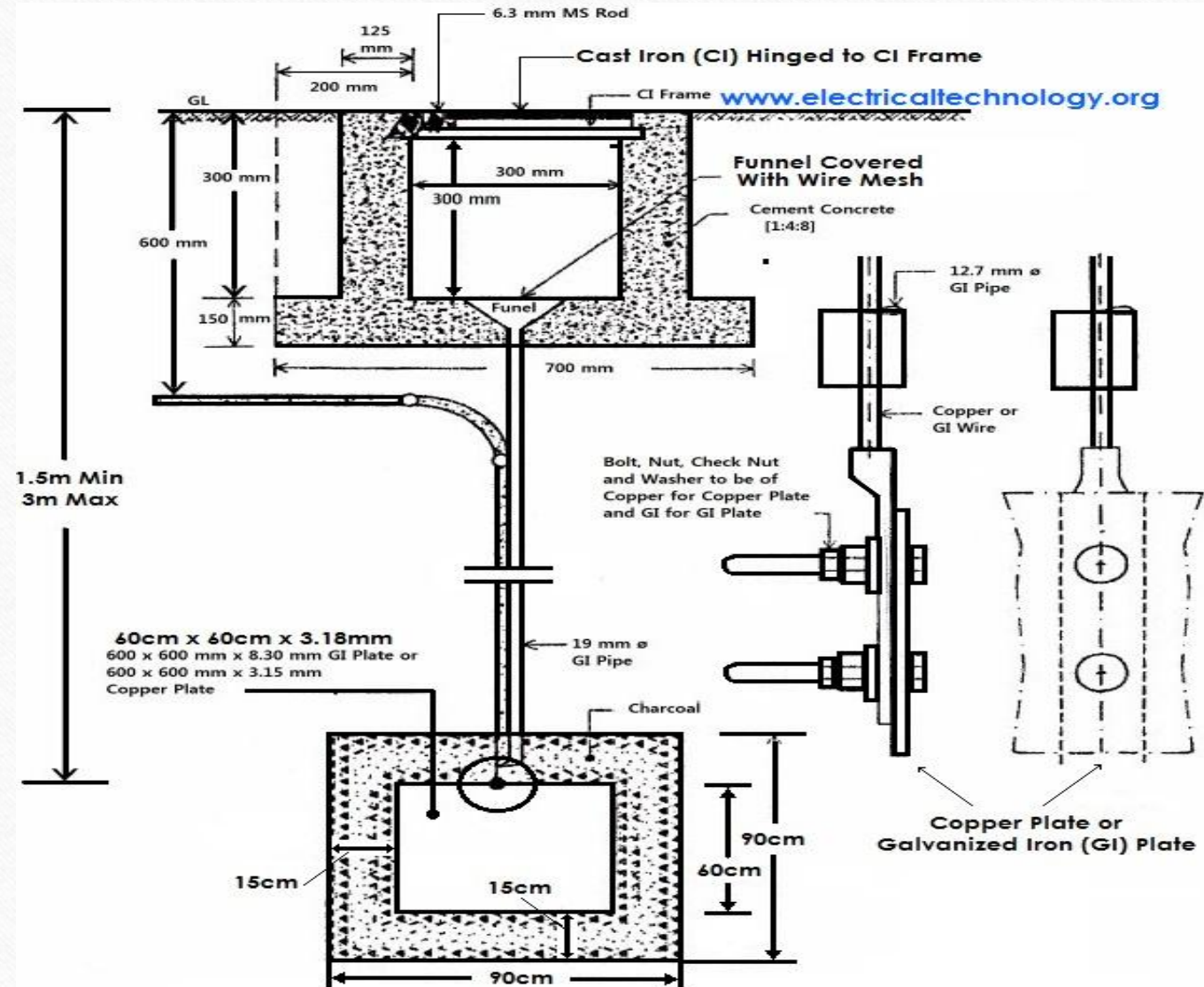
4). Earthing through the Waterman

2). Pipe Earthing:

5). Strip or Wire Earthing:

3). Rod Earthing

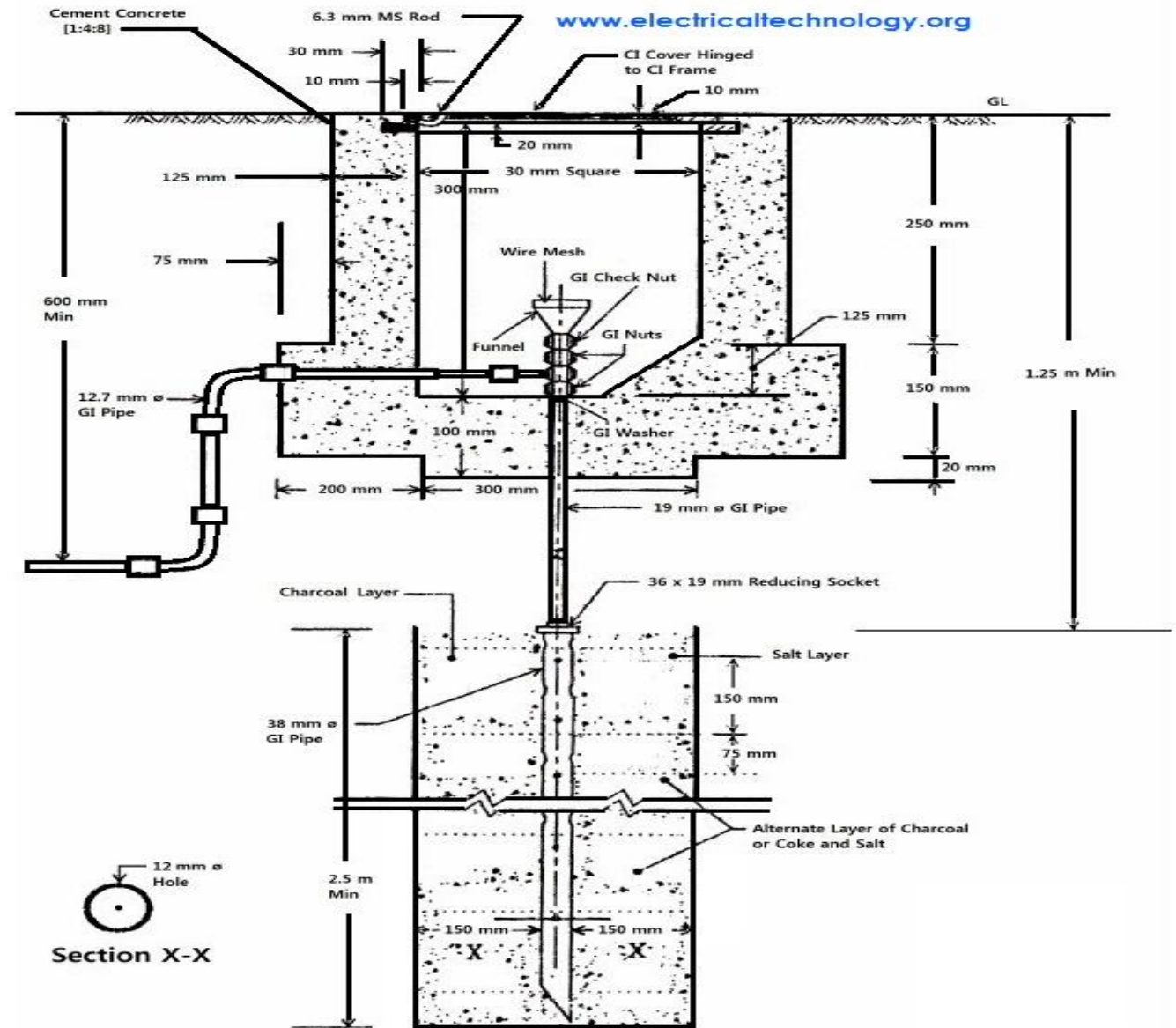
Plate Earthing



Construction of Plate Earthing

In plate earthing system, a plate made up of either copper with dimensions 60cm x 60cm x 3.18mm (i.e. 2ft x 2ft x 1/8 in) or galvanized iron (GI) of dimensions 60cm x 60cm x 6.35 mm (2ft x 2ft x 1/4 in) is buried vertical in the earth (earth pit) which should not be less than 3m (10ft) from the ground level. For proper earthing system, follow the above mentioned steps in the (Earth Plate introduction) to maintain the moisture condition around the earth electrode.

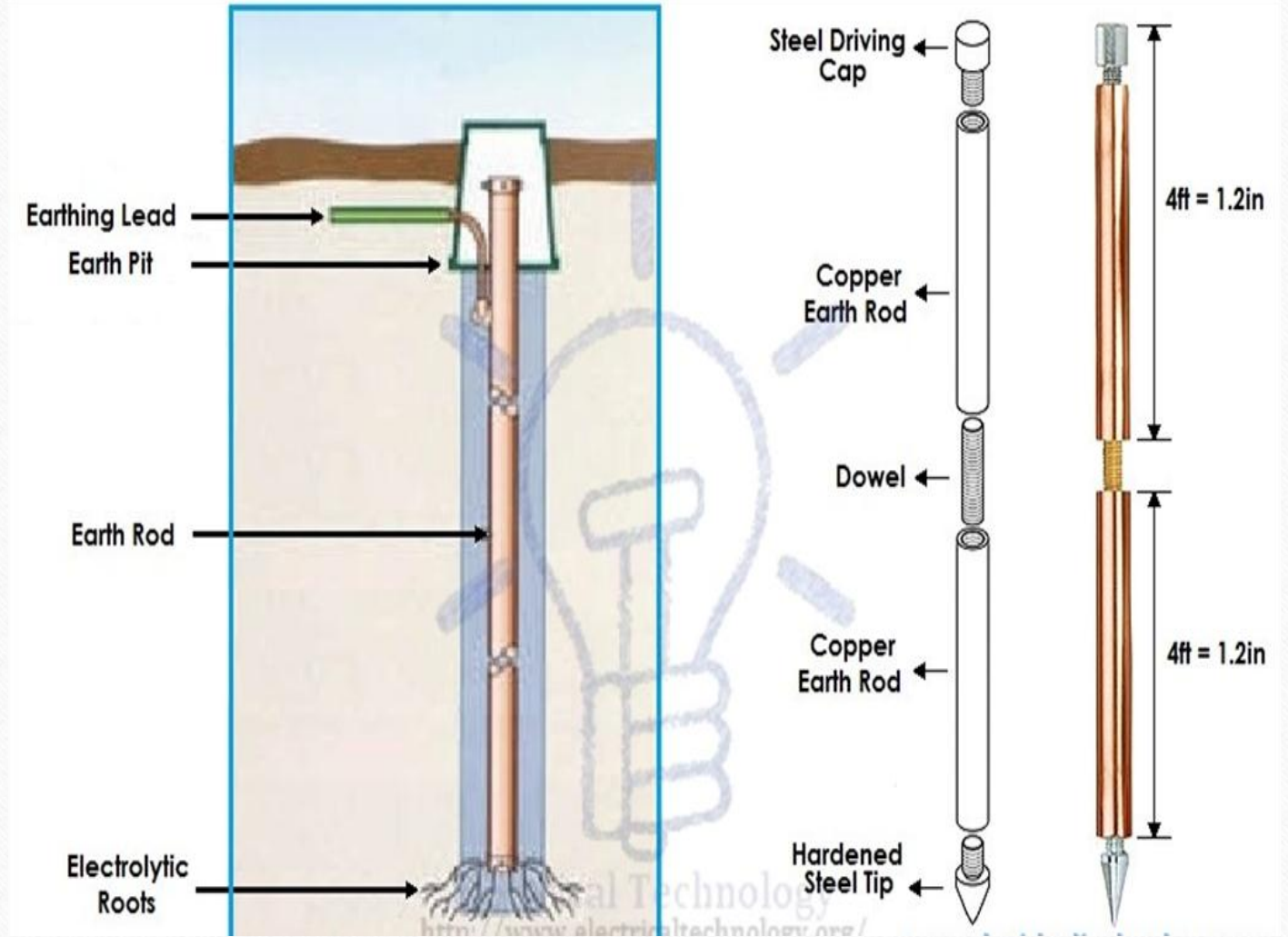
Pipe Earthing



Construction of Pipe Earthing

- ❖ A galvanized steel and a perforated pipe of approved length and diameter is placed vertically in a wet soil in this kind of system of earthing. It is the most common system of earthing.
- ❖ The size of pipe to use depends on the magnitude of current and the type of soil. The dimension of the pipe is usually 40mm (1.5in) in diameter and 2.75m (9ft) in length for ordinary soil or greater for dry and rocky soil. The moisture of the soil will determine the length of the pipe to be buried but usually it should be 4.75m (15.5ft).

Rod Earthing



Construction of Rod Earthing

It is the same method as pipe earthing. A copper rod of 12.5mm (1/2 inch) diameter or 16mm (0.6in) diameter of galvanized steel or hollow section 25mm (1inch) of GI pipe of length above 2.5m (8.2 ft) are buried upright in the earth manually or with the help of a pneumatic hammer. The length of embedded electrodes in the soil reduces earth resistance to a desired value.

Earthing through the Waterman

- In this method of earthing, the waterman (Galvanized GI) pipes are used for earthing purpose. Make sure to check the resistance of GI pipes and use earthing clamps to minimize the resistance for proper earthing connection.
- If stranded conductor is used as earth wire, then clean the end of the strands of the wire and make sure it is in the straight and parallel position which is possible then to connect tightly to the waterman pipe.

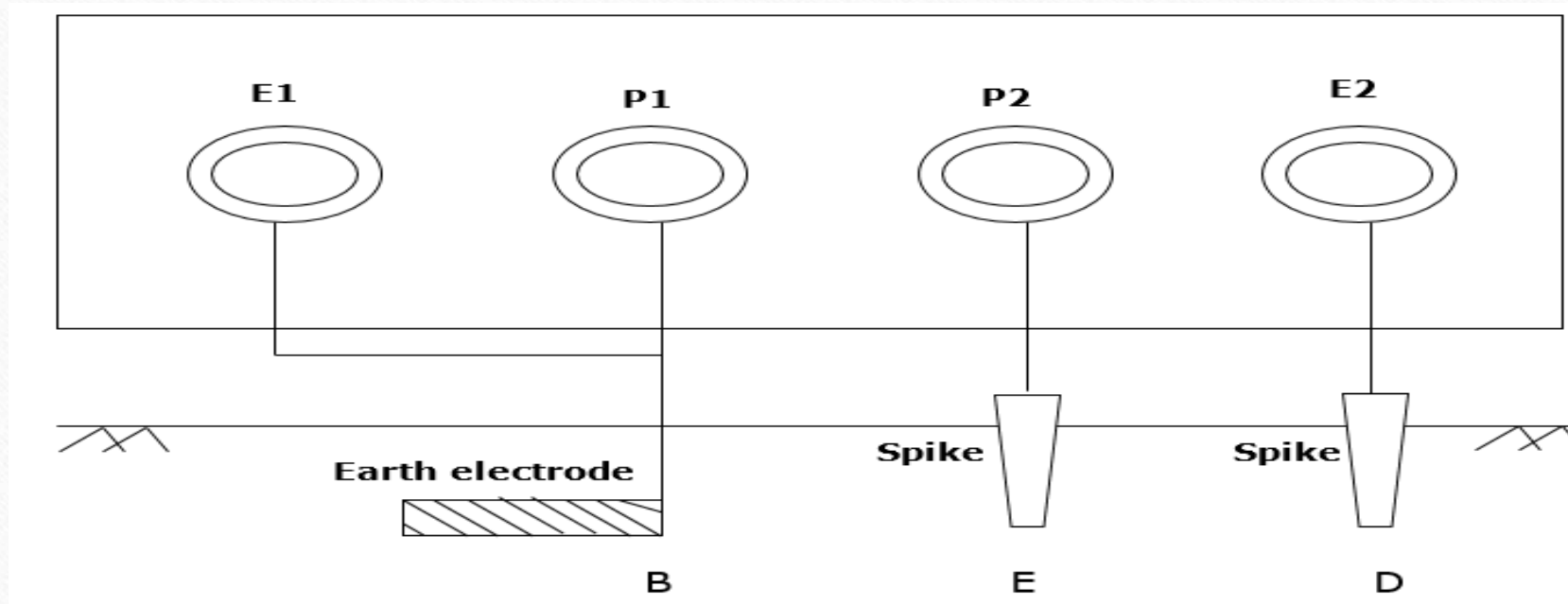
Strip or Wire Earthing:

- In this method of earthing, strip electrodes of cross-section not less than 25mm x 1.6mm (1in x 0.06in) is buried in a horizontal trenches of a minimum depth of 0.5m. If copper with a cross-section of 25mm x 4mm (1in x 0.15in) is used and a dimension of 3.0mm² if it's a galvanized iron or steel.
- If at all round conductors are used, their cross-section area should not be too small, say less than 6.0mm² if it's a galvanized iron or steel. The length of the conductor buried in the ground would give a sufficient earth resistance and this length should not be less than 15m.

Digital Earth Tester



Measurement of the earth resistance



Tabulation

S. No.	Dist. between. B and E (D in feet)	R1 at 52% D	R2 At 62% D	R3 At 72% D	Earth resistance $R_E = (R1 + R2 + R3)/3$
1					
2					
Average value					

Earth Tester

[Hand Driven Generator
Type]

