SNS COLLEGE OF TECHNOLOGY

Saravanampatti, Coimbatore – 641 035

Approved by AICTE, Recognized by UGC & Affiliated to Anna University, Chennai

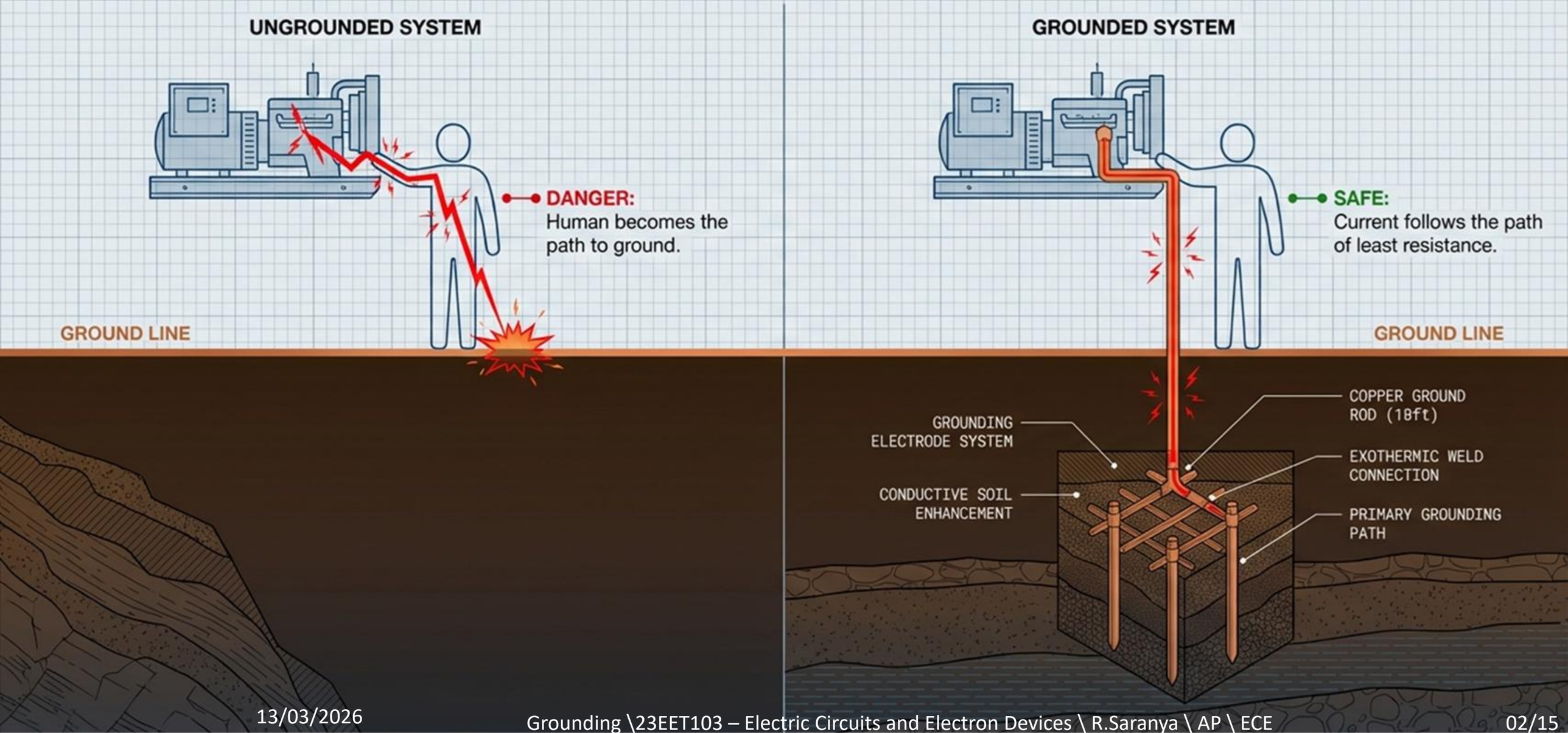
Department of Artificial Intelligence and Data Science

23EET103 – Electric Circuits and Electron Devices

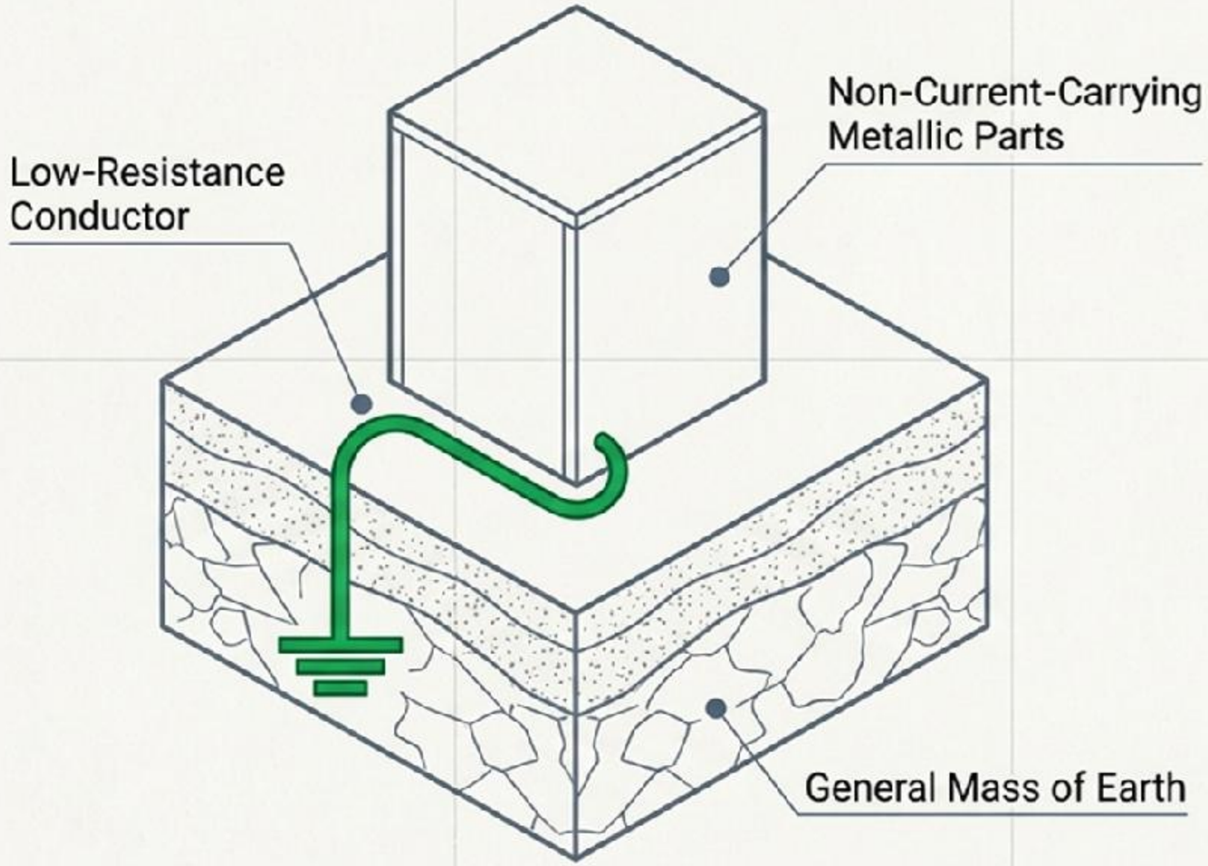
I YEAR /II SEMESTER

UNIT -3 – Grounding and Its Types

Grounding is the process of connecting electrical equipment to the earth to provide a safe path for fault currents.



Defining the Earthing Connection



The Formal Definition

Earthing (or Grounding) is the process of electrically connecting the non-current-carrying metallic parts of an electrical installation to the general mass of earth (ground) through a low-resistance conductor, so that any fault current flows safely into the earth instead of through a human body.

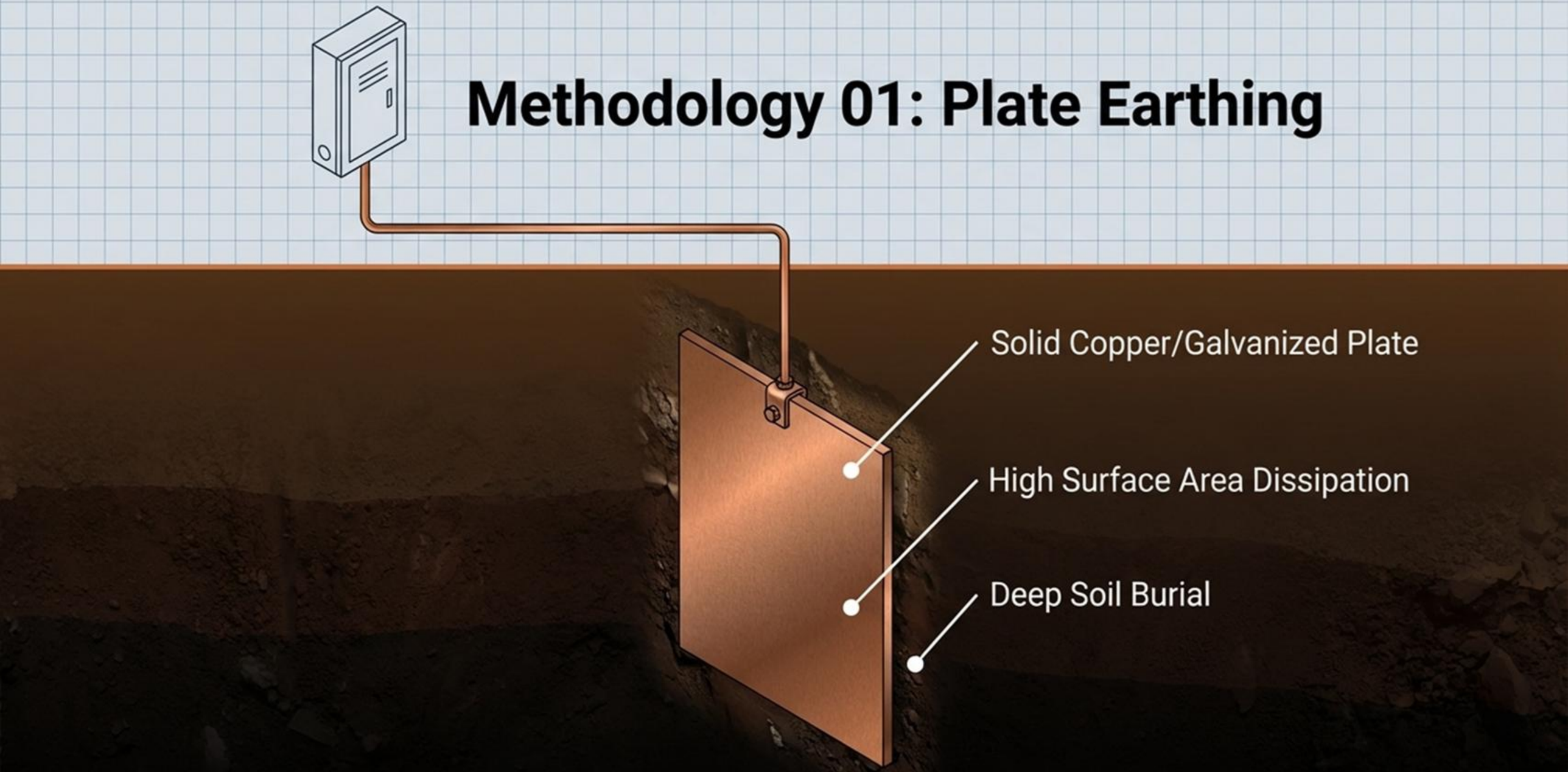
Grounding Taxonomy Matrix

Comparative analysis of standard earthing form factors.

	Plate Earthing	Pipe Earthing	Rod Earthing	Strip Earthing
Form Factor	High surface area flat plane	Hollow cylindrical tube	Solid cylindrical shaft	Long continuous flat conductor
Earth Orientation	Deep Vertical / Horizontal	Deep Vertical	Driven Vertical	Shallow Horizontal Trench
Schematic Silhouette				

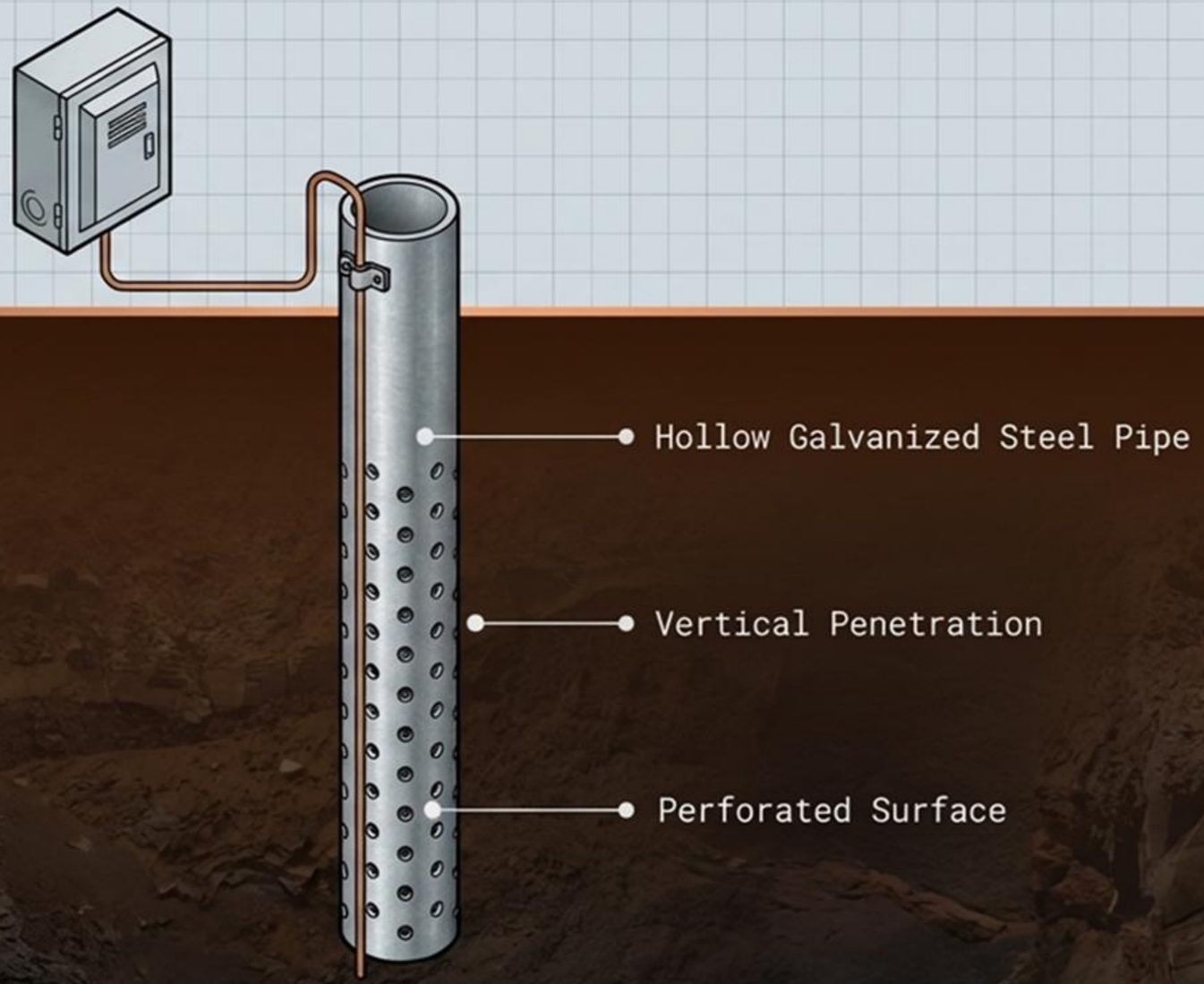
Ground Line

Methodology 01: Plate Earthing

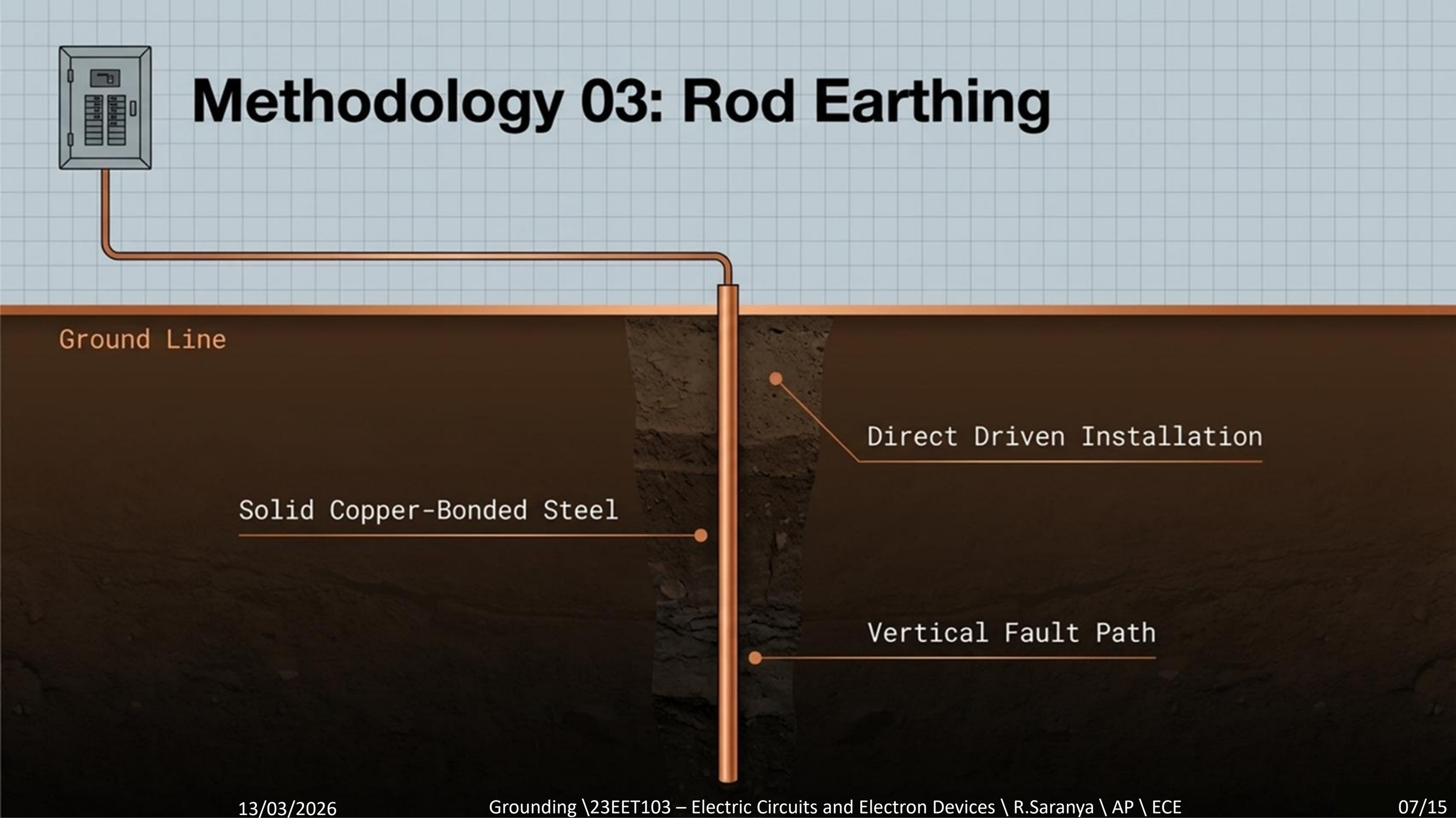


Methodology 02: Pipe Earthing

Deep vertical form factor for limited space scenarios



Methodology 03: Rod Earthing



Methodology 04: Strip Earthing

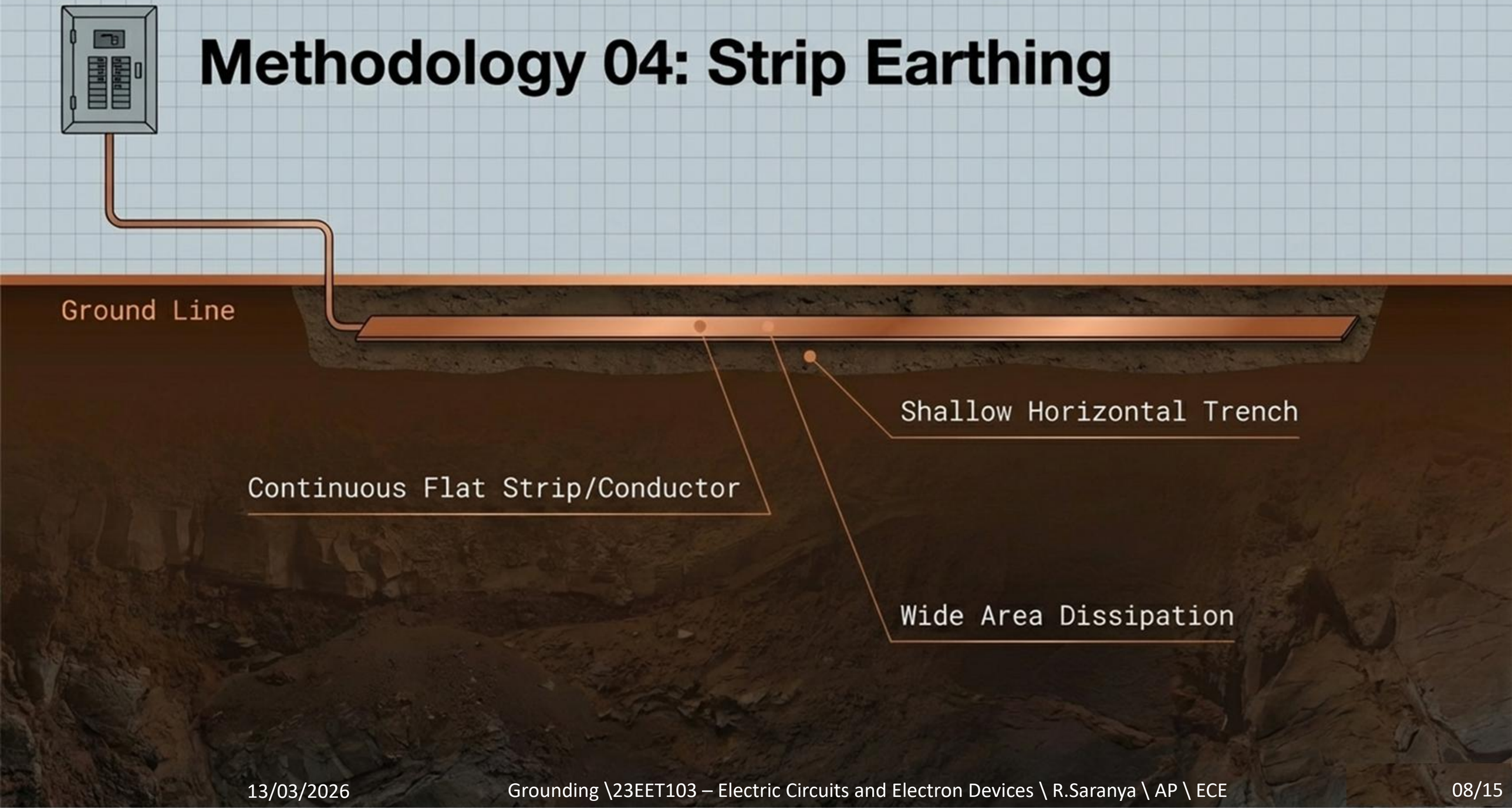
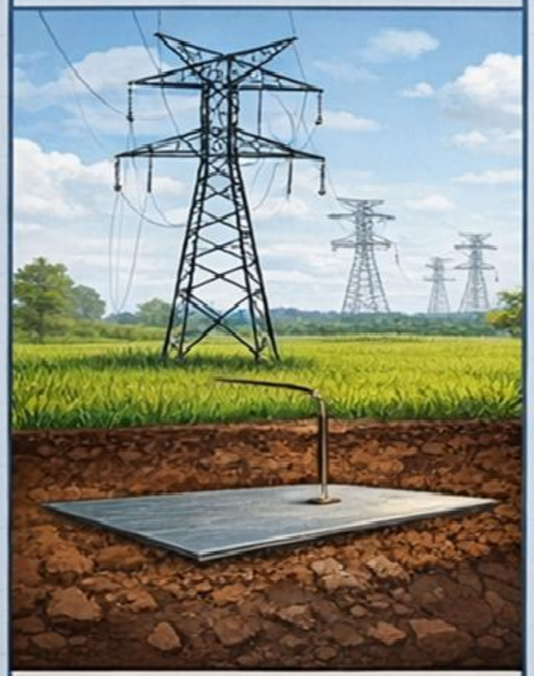


Plate Earthing



Power Stations & Substations

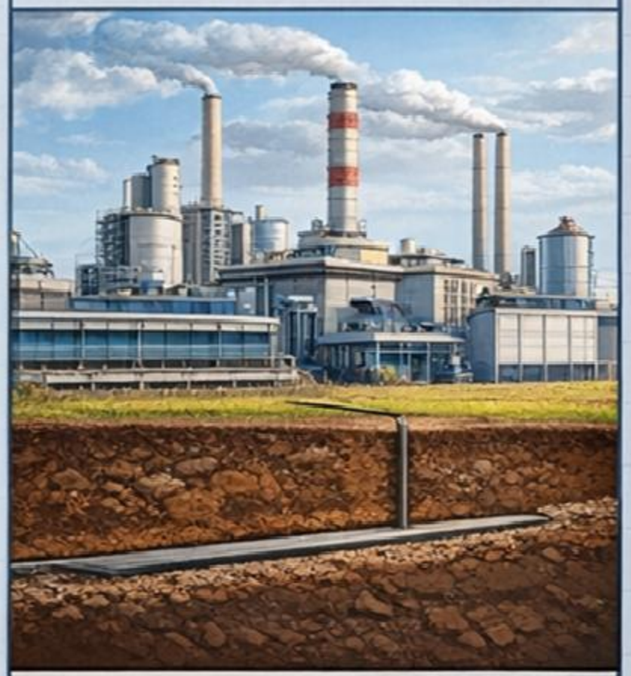
Pipe Earthing

Residential Buildings

Rod Earthing

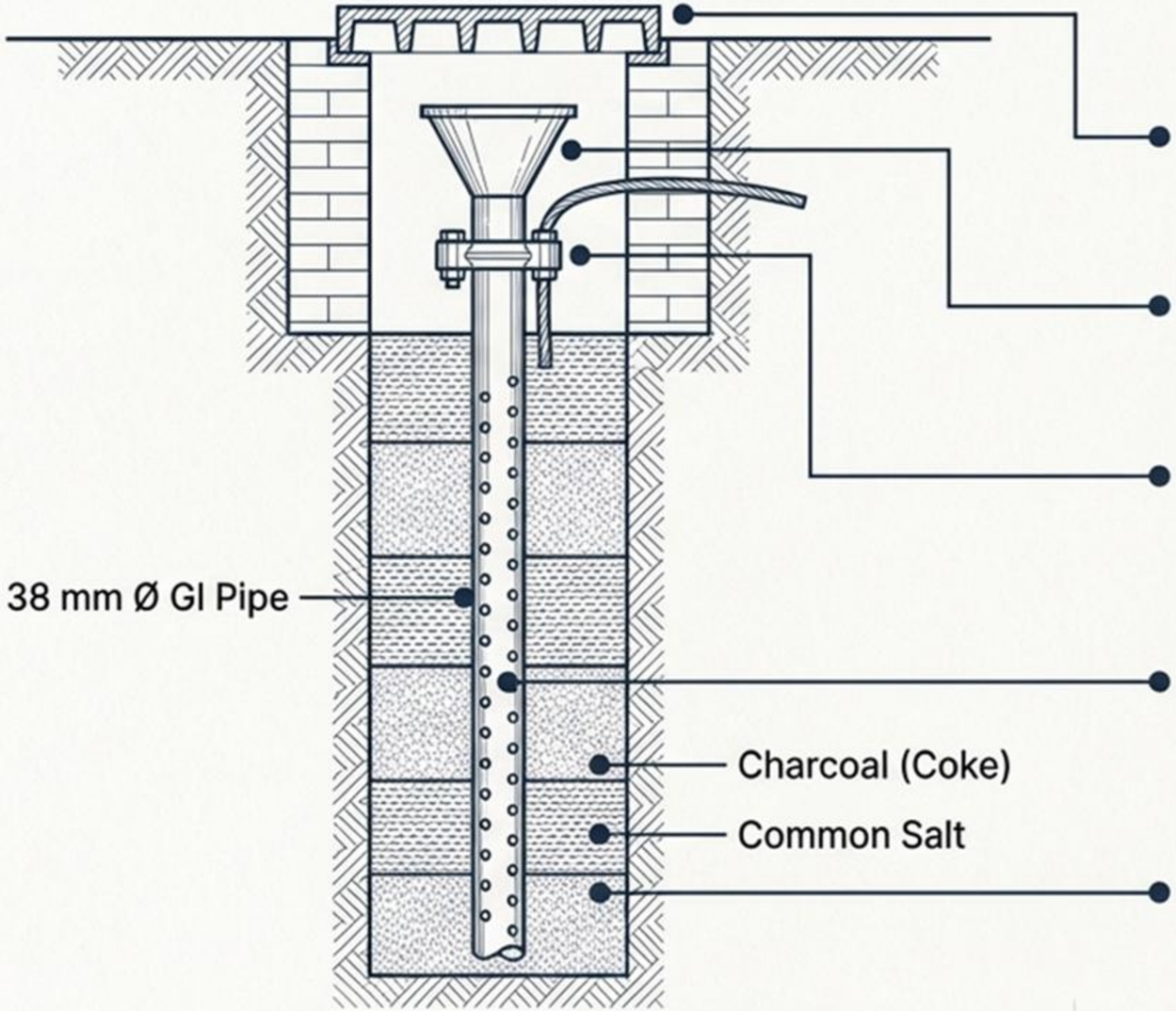
Telecom Towers & Antennas

Strip Earthing



Factories & Industrial Plants

Anatomy of a Pipe Earth Pit (IS 3043)



Surface Level: Cast Iron (CI) / GI Cover Plate over an Inspection Chamber.

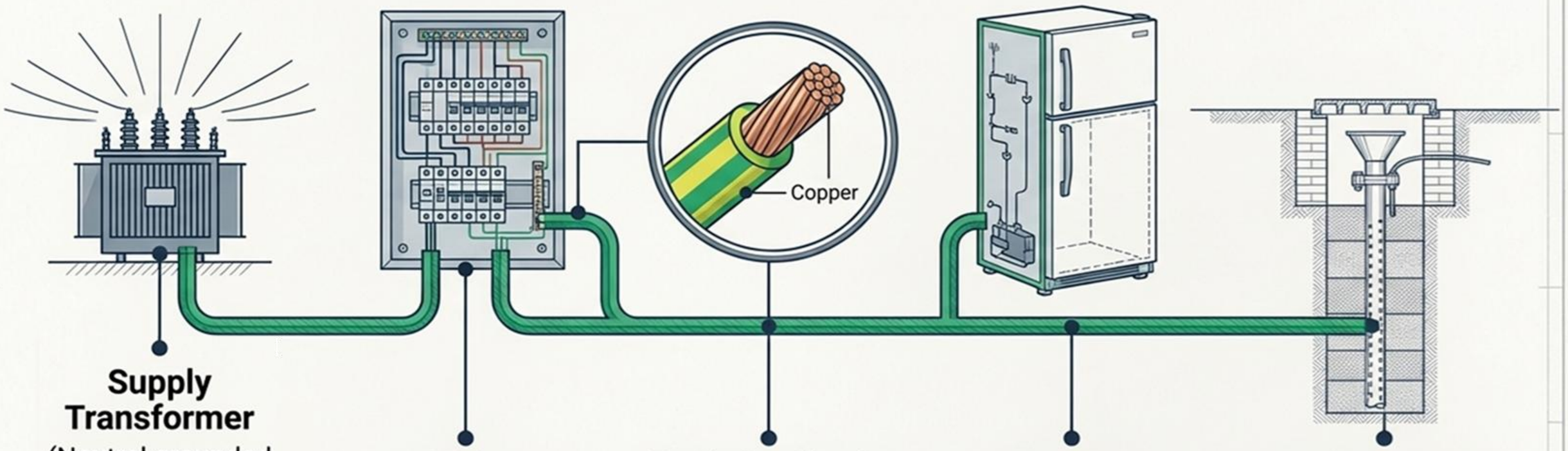
Watering System: GI Funnel inside the chamber for pouring water to maintain soil moisture.

Connection: GI Clamp firmly securing the **Earth Wire** to the top of the pipe.

The Electrode: Perforated GI Pipe, 38 mm outer diameter, extending 2 to 2.5 m deep into a 30 cm diameter pit.

The Backfill: Alternating, compacted layers surrounding the pipe, explicitly labeled as 'Mixture of Charcoal (Coke) and Common Salt'.

The Complete Building Architecture



Supply Transformer
(Neutral grounded here)

Main Distribution Board
(Earth Bar location)

Earth Continuity Conductor (ECC)
Specs: Green / Green-Yellow striped wire.
Min size: 1.5mm² Cu
(must be ≥ half the phase conductor size).

Household Appliances
(Connected to metal casings)

The Earth Pit
(The final path for fault currents)

The Safety Shield Model

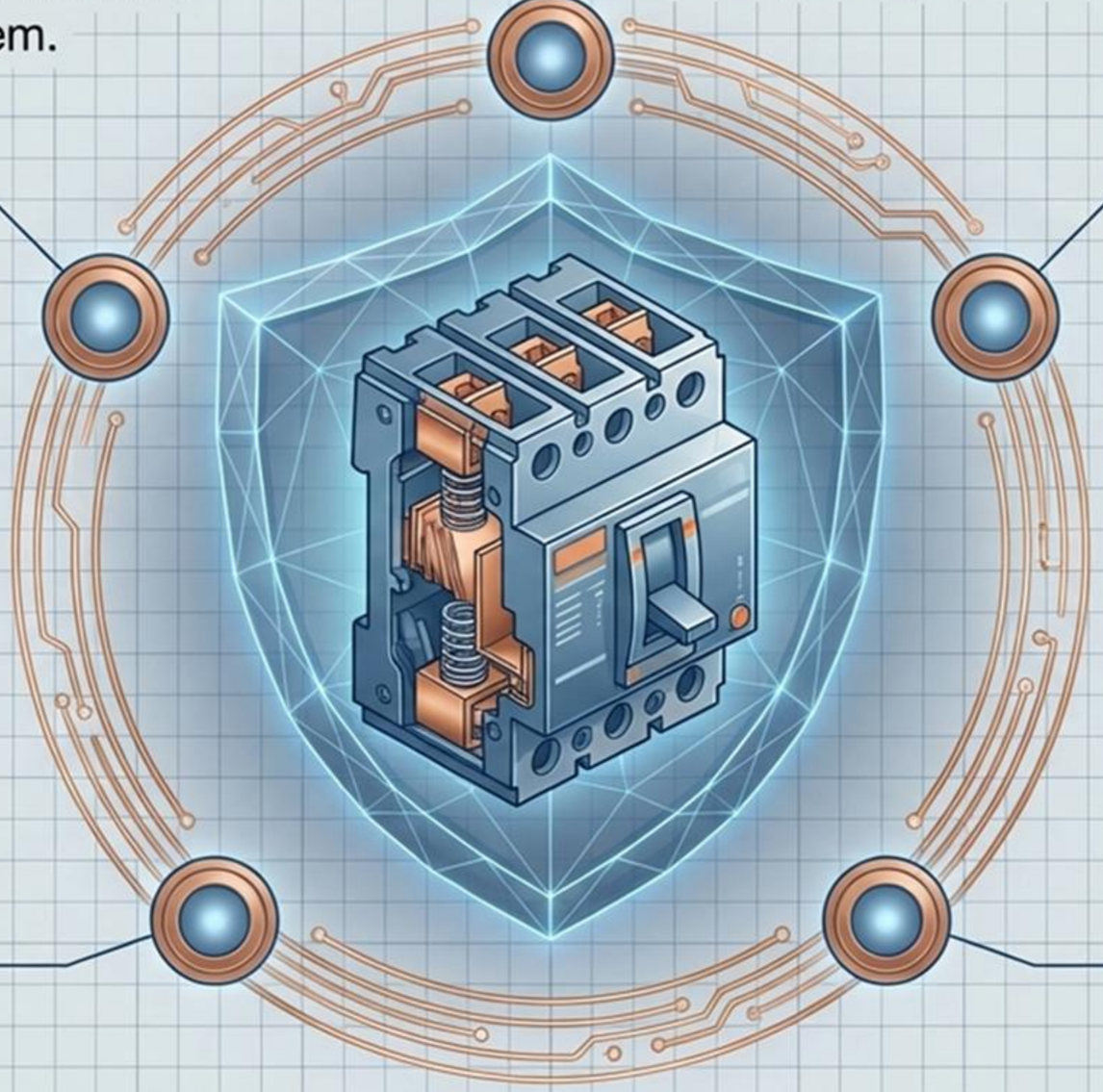
The interconnected functional benefits of a grounded electrical system.

Shock Protection
Prevents fault currents from passing through personnel.

Protective Device Operation
Ensures breakers and fuses trip reliably by providing a clear fault path.

Equipment Protection
Shields sensitive circuitry from destructive electrical surges.

Voltage Stabilization
Maintains a constant reference point to prevent voltage drift.



Fire Prevention
Eliminates stray sparking and overheating from uncontained faults.

EARTHED Vs UNEARTHED

Earthed System	Unearthed System
Shock Risk: Very Low Fault current goes to earth.	**Shock Risk:** VERY HIGH Current goes through body.
MCB Operation: Trips immediately on fault.	**MCB Operation:** May NOT Trip (Fault undetected).
Fire Hazard: Minimal (Fault cleared fast).	**Fire Hazard:** High Risk (Arcing & heating).
Equipment: Protected from surges & lightning.	**Equipment:** Damage from surges & lightning.
Voltage: Stable at 0V.	**Voltage:** Unstable (Floating Voltage).
Compliance: Fully Legal.	**Compliance:** Illegal & Unsafe.

REFERENCES

- https://testbook.com/electrical-engineering/electrical-earthing
- https://www.collegesidekick.com/study-docs/14523005
- https://electrical-engineering-portal.com/download-center/books-and-guides/power-substations/grounding-systems

THANK YOU