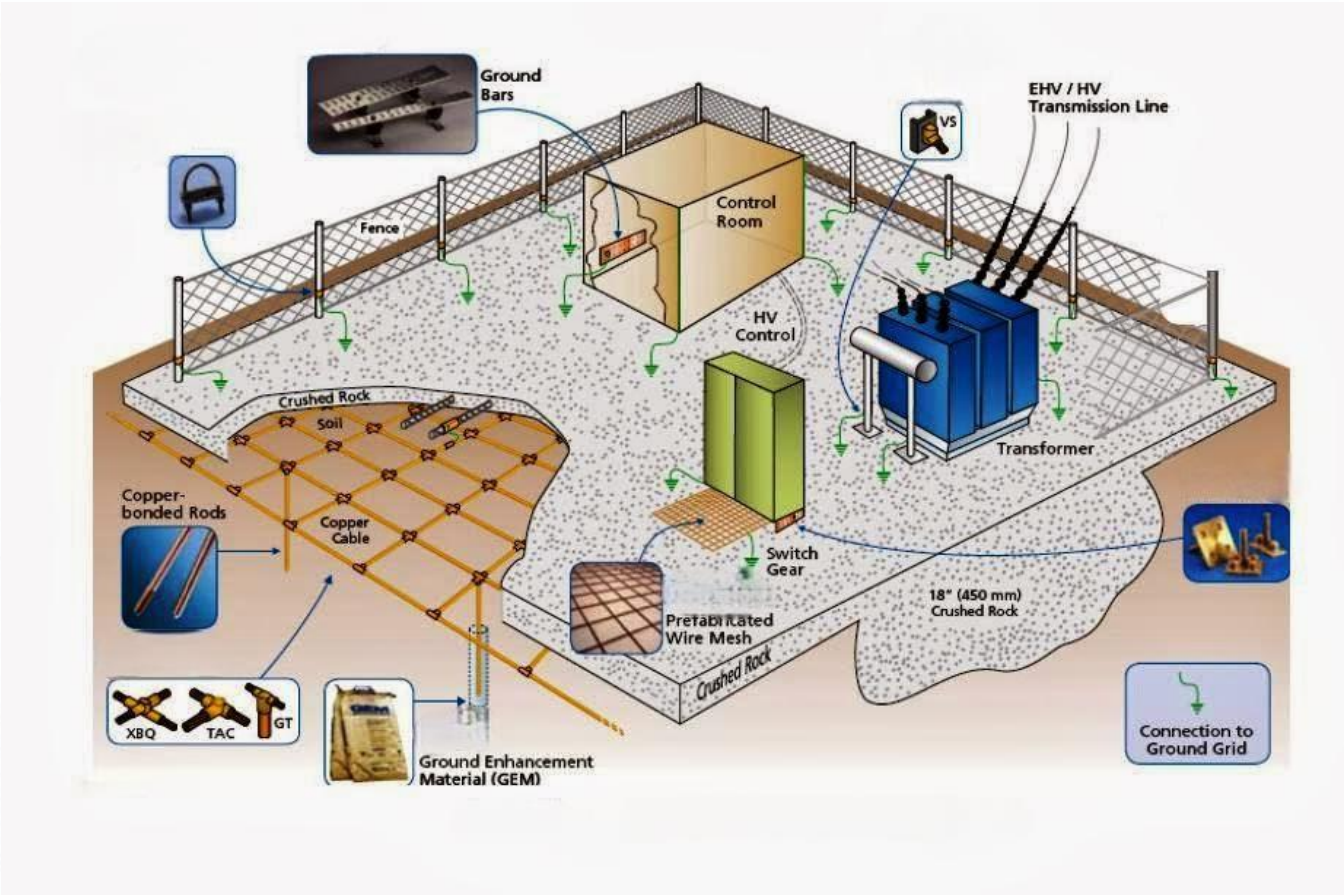
APSTECHS UK LTD.

Design And Engineering Solutions For Power Sector



Empowering Safety

Through

Effective Earthing

Introduction

- At APSTECHS, we specialize in delivering comprehensive earthing solutions for all types of substation projects. Our approach begins with precise soil resistivity testing, ensuring a solid foundation for effective earthing design. Utilizing advanced software tools such as CDEGS, we develop customized earthing designs that meet the specific needs of each project.

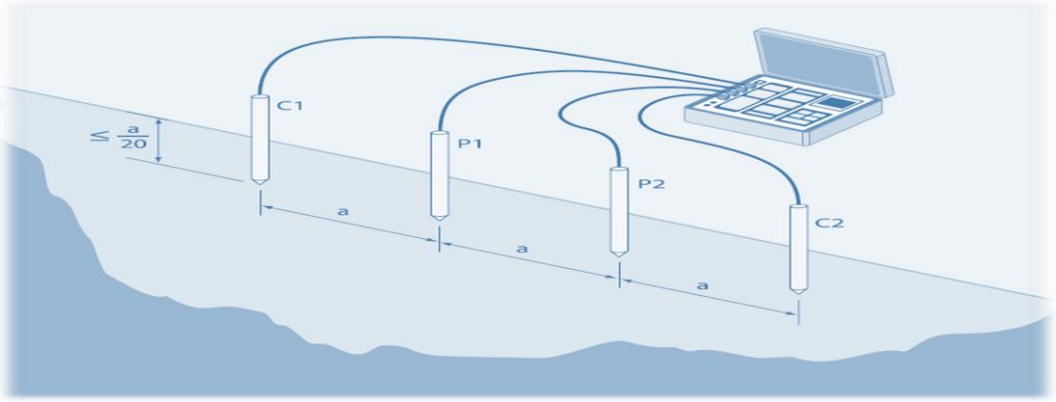
- Our expertise extends to preparing detailed earthing layout drawings, allowing for clear and efficient implementation on-site. Based on the earthing design we provide the necessary earthing materials, ensuring optimal performance and safety.

- With APSTECHS, you can trust that your earthing systems will be robust, reliable, and compliant with industry standards. Let us partner with you to enhance the safety and efficiency of your substation projects.

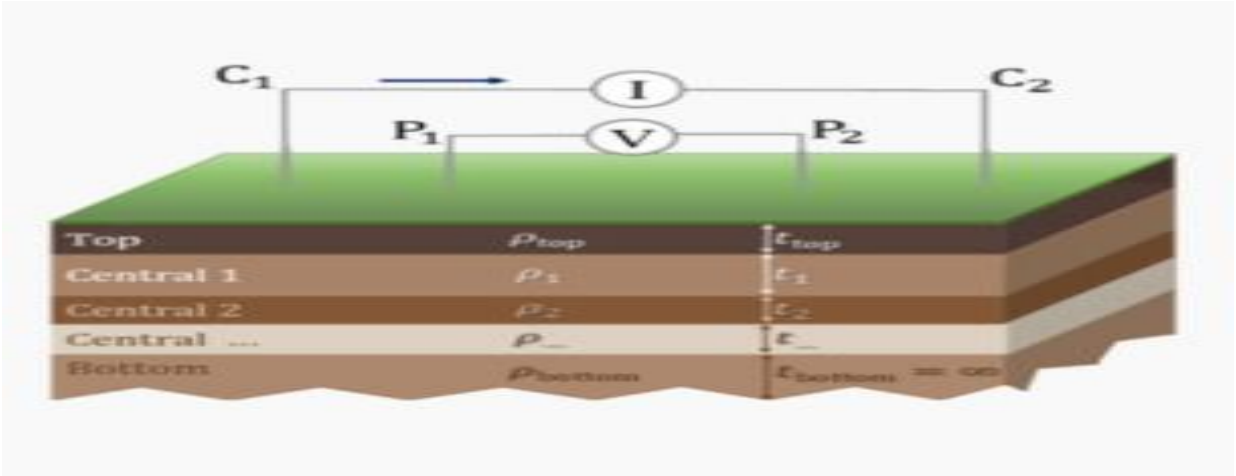
On-site testing

Onsite Soil Resistivity Test

A soil resistivity test using a Megger DET and the Wenner 4-pole method measures the electrical resistance of soil, which is crucial for grounding system design. In this method, four equally spaced electrodes are inserted into the ground, allowing for accurate resistance measurements. The Megger DET applies a current between the outer electrodes and measures the voltage between the inner ones. The data collected can be analysed using the CDEGS Recap module, which provides insights into soil conductivity and helps optimize grounding systems for safety and efficiency in electrical installations. This testing is vital for ensuring reliable performance.



Wenner 4-pole method



Multi-layer soil model

CDEGS

APSTECHS UK Earthing Design Expertise

At APSTECHS UK, our engineers leverage advanced automated grounding system design software to deliver precise and compliant solutions.

Key features include:

- **Grounding Analysis Module**: Analyses safety performance and estimates resistance for various grounding configurations.
- **Soil Analysis Module**: Develops earth structure models based on soil resistivity data.
- **Fault Current Distribution Module**: Calculates fault current distribution with minimal input, ensuring accurate assessments.
- **Safety Module**: Generates safety thresholds based on recognized standards to guide design decisions.
- **View, Plot, and Report Tools**: CAD-based visualization and flexible reporting
- capabilities for clear presentation of results.

RESAP, MALT, MALZ

SPLITS, FCDIST

TRALIN, HIFREQ

With these tools, our engineers ensure robust grounding designs tailored to specific project requirements

Earthing Material

COPPER TAPE

(AP/E/001)

Copper tape is commonly used for connecting equipment to the main earthing system through risers, ensuring a reliable and low-resistance path for electrical fault currents. It serves as a critical component in grounding systems, providing a safe route to disperse electrical energy into the earth, which protects both equipment and personnel from electrical hazards.

Typical Specifications:

Available Dimensions (Width)x(Thickness)x(Length):

- 25MM X 3MM X 10M
- 25MM X 6MM X 10M
- 40MM X 4MM X 10M
- 50MM X 6MM X 10M

Resistivity: 1.68 × 10^-8 Ω·m at 20°C(Approx.)

Conductivity: Excellent electrical conductivity (nearly 100% IACS)

Temperature range: -65°C to 150°C

COPPER CLADDED STEEL ROD

(AP/E/002)

Copper Bonded Steel Rods are most appreciable and highly preferrable product known for its ultimate performance with significance of no hidden factor. These low carbon, molecularly bonded mild steel rods are manufactured, inheriting 99.99% pure electrolytic copper coating of minimum 250 microns. This combination contributes to the high tensile strength and remarkable conductivity of the whole system.

Typical Specification:

Core Material: High tensile steel (often carbon steel).

Outer Layer: Electrolytic copper bonding for corrosion resistance.

Copper Thickness: Minimum copper bonding thickness is usually 250 microns (0.25 mm).

Diameter: Common diameters: 12.5 mm, 14.2 mm, 16 mm, or 20 mm.

Length: Earth rods come in standard lengths such as 1.2 m, 1.5 m, 1.8 m, and 2.4 m.

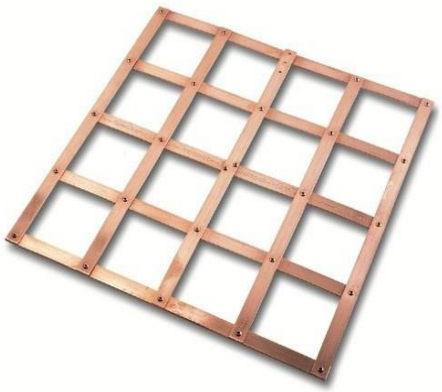
Compliance: Meets IEC 62561-2 standards.

Mechanical Strength: 600-700 N/mm²(Approx.)

COPPER LATTICE MAT

(AP/E/003)

A copper lattice earth mat, also known as a grounding mat or earthing mat, is used to provide a low-resistance path to the ground for electrical systems.



Typical Specification:

Material: Electrolytic copper

Dimensions: 600mm x 600mm

Copper Thickness: 3mm to 6mm

Grid Spacing: 75mm to 150mm

Electrical Conductivity: > 99% IACS (International Annealed Copper Standard)

Tensile Strength: > 200 N/mm²(Approx.)

Resistance: Less than 5 ohms

Installation Depth: 0.75 meters below ground

Compliance: Meets IEC 62561-2 standards

TINNED COPPER BRAID Coil (AP/E/004)

Tinned copper braid is commonly used in electrical applications for its flexibility and conductivity. The braid is used for grounding, shielding, and providing a conductive path in various electronic and electrical systems.

Typical Specification:

Material: Tinned copper

Width: 15mm

Thickness: 1.5mm

Cross-Sectional Area: 10mm²

Length: upto 20 meters

Type: Braid (often used for shielding or grounding purposes)

Tinning: Tinned (coated with a thin layer of tin to prevent corrosion and enhance solderability)

EARTH BAR

(AP/E/005)

An earth bar, often referred to as an earthing bar or grounding bar, is used in electrical systems to provide a common connection point for multiple ground wires.

Typical Specification:

Material: Copper

Length: 800 mm

Width: 30 mm

Thickness: 8 mm

Connection Points: 6 and 10

Hole Size: 6 mm diameter

Compliance: Meets IEC 60439 standards

EARTH ROD COUPLING COPPER ALLOY

(AP/E/006)

An **earth rod coupling** is a mechanical connector used to join two or more earth rods together in an extensible grounding or earthing system.

Typical Specification:

Material: Copper alloy (Brass or phosphor bronze).

Dimensions:

- Internal Diameter (ID): 19 mm (to match the rod diameter).
- External Diameter (OD): 23-25 mm
- Length: Range from 50 mm to 100 mm

Threading:

- Thread Pitch: 2-3 mm
- Thread Length: 20-30 mm on both sides of the coupling

Mechanical Strength:

- Tensile Strength: 500 MPa
- Shear Strength: 150-300 MPa

Compliance: Meets IEC standards BS EN 50164-2

EARTH ROD DRIVING STUD

(AP/E/007)

An **earth rod driving stud** (also known as a driving head or driving tip) is a tool used to protect the top of an earth rod during installation, especially when the rod is driven into the ground using a hammer or mechanical driving equipment.

Typical Specification:

Material Type: Hardened steel or high-strength alloy.

Hardness: Typically rated at 45-50 HRC

Length: 50mm to 100mm

Thread pitch: 2-3mm

Compliance: Meets IEC standards BS EN 50164-2

Diameter: Available sizes include 12.5 mm, 14.2 mm, 16 mm, and 19 mm to correspond with the respective rod diameters

EARTH ROD DRIVING POINT

(AP/E/008)

An **earth rod driving point** (also known as a driving tip or driving spike) is an attachment used at the bottom of the earth rod to facilitate easy penetration into the ground. It helps protect the earth rod from damage as it is driven into the soil and ensures the rod can penetrate hard soil or rocky layers.

Typical Specification:

Material Type: Hardened steel or high-strength alloy.

Length: Typically, between 75 mm to 150 mm

Dimension: Common sizes include 12.5 mm, 14.2 mm, 16 mm, and 19 mm, depending on the diameter of the earth rod.

Hardness: 45-55 HRC

Taper Angle: 30°-45°

Compliance: Meets Standard **BS EN 50164-2.**

EARTH ROD TO TAPE U BOLT CLAMP

(AP/E/009)

An Earth rod to tape U-bolt clamp is a component used to securely connect grounding rods (earth rods) to grounding tapes in electrical installations.

Typical Specification:

Material: Brass or Copper Alloy, Galvanized Steel

Rod Size Compatibility: 19mm (3/4 inch) Earth Rod

Tape Compatibility: 20mm to 40mm

Standards: Meets IEC standards BS EN 62305

EARTH ROD TO CONDUCTOR G CLAMP ROD

(AP/E/010)

The **Earth rod to conductor G-clamp** is used to connect an earth rod to a conductor (such as a cable or tape) in grounding and bonding systems.

Typical Specification:

Material: Copper or Copper Alloy, **Brass**, Stainless Steel

Rod Size Compatibility: 19mm (3/4 inch)

Conductor Size Compatibility: 25mm² to 95mm²

Design: G-shaped Body, Bolts and Nuts

Corrosion Resistance: Compliance with standards like **BS EN 62305** for lightning protection is essential

Standards: Meets with IEC standards BS 7430**,** EN 62561-1, or IEC 62561

REBAR CLAMP FOR REBAR (DOUBLE CLAMP)

(AP/E/011)

A **rebar clamp for 20-25mm rebar (double clamp)** is a specialized fitting used to connect rebar (reinforcing bars) to a grounding conductor in electrical earthing systems

Typical Specification:

Material: Copper, Brass, Galvanized Steel

Rebar Size Compatibility: 20-25mm rebar

Conductor Size Compatibility: Copper cables**-** 16mm² to 95mm²**,** Copper tape**-** 20mm to 40mm

Tensile Strength: 250-400 MPa

SQUARE TAPE CLAMP CU ALLOY

(AP/E/12)

A **square tape clamp** is a device used to secure or hold square or rectangular-shaped tape or cables in place.

Typical Specification:

Material: Copper alloy (often brass or a similar alloy)

Shape: Square or rectangular clamp

Width: 25 mm

Thickness: 6 mm

ALUMINIUM BAR MALLEABLE

(AP/E/013)

Typical Specification:

Available Dimensions:

- 40MM X 6MM (4M)
- 60MM X 6MM (1M)
- 40MM X 6MM 90 DEG BEND (125MM)

Length: Standard lengths are usually around 1 to 6 meters (custom lengths can be ordered).

Tensile Strength: Typically ranges from 90 MPa to 310 MPa

Yield Strength: Between 35 MPa and 275 MPa for malleable aluminium alloys.

Elongation: Around 8% to 12%

Density: Approximately 2.7 g/cm³

CONCRETE EARTH INSPECTION PIT

(AP/E/14)

A **concrete earth inspection pit** is used in grounding or earthing systems to provide easy access for testing and inspection of the earth electrode connections.

Typical Specification:

Width/Diameter: Between 250mm to 300mm

Height: Usually ranges from 200mm to 250mm

Load Bearing Capacity: 5 kN to 10 kN

Material: Concrete

Cover: Concrete or galvanized steel

PLASTIC EARTH INSPECTION PIT

A plastic earth inspection pit is typically used in grounding systems to provide access for inspection and maintenance of earthing electrodes.

Typical Specification:

Material: High-Density Polyethylene (HDPE) **or** Polypropylene

Dimensions: Top opening (Diameter) 200-300 mm, Depth typically around 250-350 mm

Features: Non-conductive material, Removable lid, Drainage holes, etc.

Wall thickness: Between 3-10 mm

Load Rating: Light Duty: 5 kN, Heavy Duty:

Weight: 2-5 kg

Compliance: IEC 62561

FENCE INSULATOR

(AP/E/015)

Fence insulators are crucial components in electric fencing systems, used to prevent the electrical current from being grounded through the fence posts.

Typical Specification:

Voltage Rating: Typically, from 5,000 to 30,000 volts

Height/Length: 2-6 inches (50-150 mm)

Weight: around 50-150 grams per insulator

Tensile strength: 10-20 kN

Wire Compatibility: 2.5 mm and 5 mm

Material: UV-stabilized plastic, Ceramic/Porcelain and Rubber

Compliance: IEC 60335

GUARDIAN SECURITY PIN STAINLESS STEEL

(AP/E/015)

The **Guardian Security Pin Stainless Steel** typically refers to a specific type of locking or security pin used in high-security environments. These pins are designed to prevent tampering, provide corrosion resistance, and secure components effectively.

Typical Specification:

Material: Stainless Steel (Grade 304 or 316)

Diameter: 5 mm and 20 mm

Length: 20 mm to 200 mm

Thread Length: 15 mm and 50 mm

Tensile Strength: 500-700 MPa

Standards Compliance: ASTM A193 / A194

RUBBER MAT FLUTED

(AP/E/016)

Typical Specification:

Length: 2 meters (2000 mm)

Width: 1 meter (1000 mm)

Thickness: 6 mm

Weight: 5-6 kg/m²

Hardness (Shore A): 65-70 Shore A

Tensile Strength: 3-5 MPa

Temperature Resistance: -20°C to +70°C

Electrical Insulation: IEC 61111

EXOTHERMIC WELDS

(AP/E/017)

Exothermic Welding is a globally accepted method to make reliable and safe connections between two or more conductors. This technology is highly portable and does not require any external source of heat to make a joint offering in permanent molecular bonding among metallic conductors.

Technical features:

Exothermic Weld connections form a solid bond around the conductor's assuring continuity.

Standard exothermic weld has a cross-section greater than that of the conductor to be joined, the weld will always remain cooler than the conductor under fault conditions.

Superior electrical conductivity of the conductors themselves.

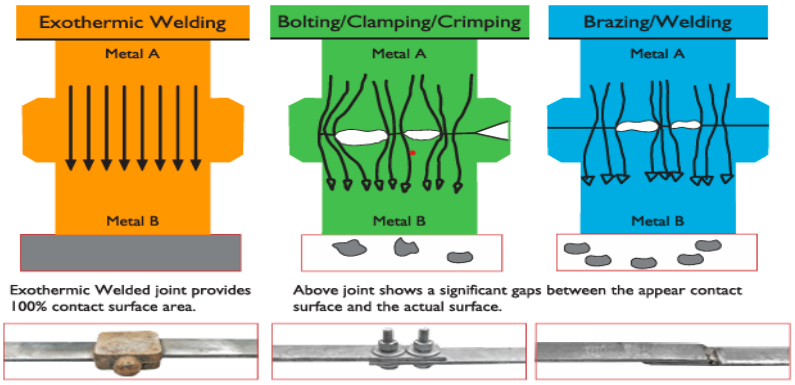
Does not corrode, oxidize or degrade with time and is resistant to galvanic coupling.

Able to withstand repeated electrical discharges.

No environmental impact.

Compared to other forms of welding, exothermic bonds have a higher mechanical strength.

BEST METHOD FOR ALL BIMETALLIC CONNECTIONS



Exothermic Welding System Meets or exceeds

- NBC 2016
- IEEE 80
- IEEE 837
- UL 467
- BS 7430

Exothermic Weld Joints	Bolting/Clamping/Crimping	Brazing/Welding
100% Contact Surface Area	Only 8-13 % Contact Surface Area	10-25 % Contact Surface Area
Temperature Bearing Capacity is more than 1083°C	Temperature Bearing Capacity is less up to 250°C	Temperature Bearing Capacity is less up to 350°C
Connection doesn't loosen with time	Gets loosened over the period of time	Degrades or loosens with passing time
Offers long life and joints will not deteriorate with age	Get corroded with time due to aging and low maintenance	Get rusted due to bad environmental conditions

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