



Earthing Solutions

ALTERNATIVES TO COPPER

SECURING ELECTRICAL INFRASTRUCTURE

Reducing Theft, Saving Lives, Maintaining Reliability



THE PROBLEM: WHY COPPER?

High scrap value makes copper the primary theft driver. It is easy to access and cut from exposed infrastructure.

The Consequence: Unsafe operating environments, equipment failure, and electrocution risks. When an earth lead is stolen, the safety mechanism is neutralized, creating dangerous "floating" potentials where equipment casings become live.



THE SOUTH AFRICAN CONTEXT



The "Copper Crisis" became a catalyst for innovation.

Strategies adopted:

- Replacement with Aluminium-Clad Steel (ACS)
- Concrete-encased electrodes
- Visual deterrence and community engagement

The shift was about changing the "value proposition" for the thief. If the material cannot be sold, the theft stops.





ALUMINIUM-CLAD STEEL (ACS)



The Gold Standard Alternative. Conductivity of Aluminum combined with the Strength of Steel.

Benefits:

- Low resale value (Deters theft)
- Corrosion resistant
- Reliable fault current dissipation
- Difficult to cut with standard hand tools



Low Scrap Value

High Strength

Corrosion Resistant

Fault Clearing

CONCRETE- ENCASED ELECTRODES

Impossible to Steal

Embedded in concrete, physically impossible to remove.



Dry Soil Performance

Superior performance in dry and sandy soil conditions.



Structural Integration: Utilizing the foundation steel of the substation. Also known as Ufer Grounding.



Longer Lifespan

Protected from environmental degradation.



Permanent Solution

Solves the theft problem permanently for the asset.

CHEMICAL & SYNTHETIC GROUNDING



Conductive Concrete Backfills

For high-value or remote assets, carbon-based electrodes provide a permanent, theft-proof solution. No resale value means no incentive for criminals. These materials represent the future of grounding technology.

Graphite-Based Electrodes

Advanced materials with zero scrap value. Lightweight, easy to install, and provide excellent resistance characteristics that often outperform traditional copper rods. Maintenance-free with stable resistance over time.



THE DETERRENCE STRATEGY

It is not just the material. A comprehensive approach includes:

- DNA Tagging: Synthetic DNA that links stolen metal to a specific utility
- Visual Deterrence: Warning signage and tamper-evident seals
- Community Involvement: Reporting schemes and awareness campaigns

When thieves know police can trace metal back to the source, the risk of selling it increases significantly.



RECOMMENDATIONS & CONCLUSION

Immediate Actions:

1. Audit existing "high-risk" assets
2. Pilot ACS or Graphite replacements
3. Implement "No Value" branding

The Goal: Safety through design, not just security. We must "design out" the theft by moving to materials thieves do not want.

