Preprint of the paper

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I. Colominas, F. Navarrina, J. Gómez-Calviño, M. Casteleiro (2001)

Proceedings of the "6th US National Congress on Computational Mechanics", Dearborn, USA

http:/caminos.udc.es/gmni

A NUMERICAL APPROACH FOR COMPUTING TRANSFERRED POTENTIALS IN GROUNDING ANALYSIS

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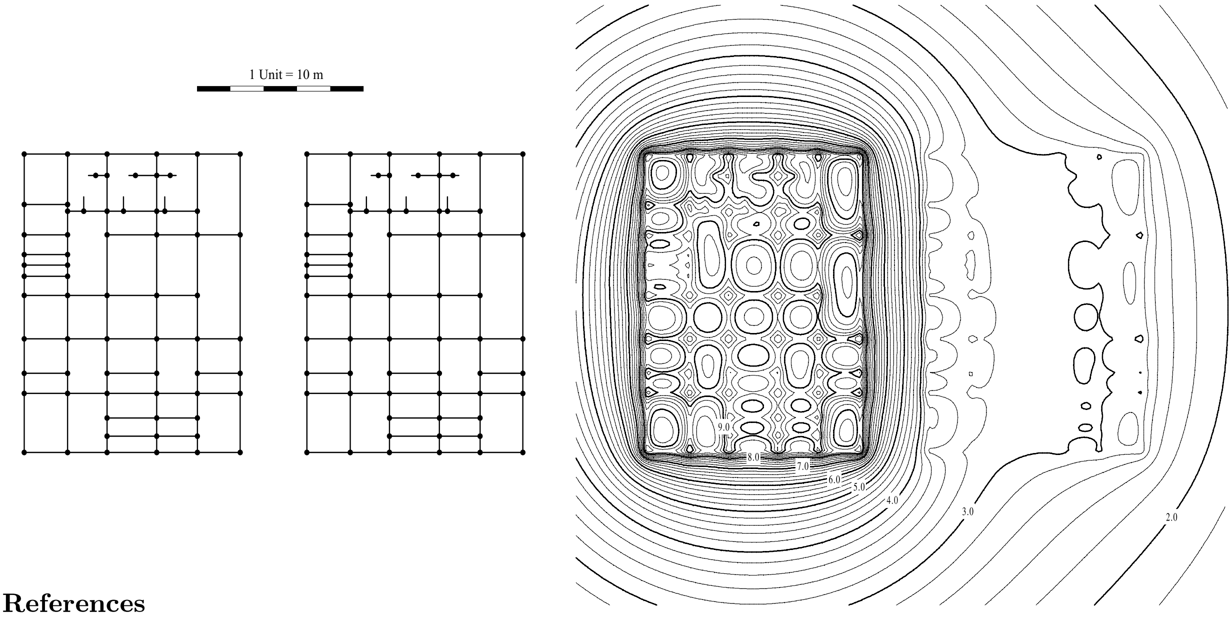
Designing safe grounding systems for large electrical installations has been a challenging problem since the early days of the industrial use of electricity. Grounding systems are intended to guarantee personal security, protection of equipments and continuity of power supply. Hence, the most significant parameters that should be computed throughout the design process are the equivalent resistance and the potential field on the surface due to a fault current being derived into the earth. The equations that govern these phenomena can be stated from Maxwell's Electromagnetic Theory. In most real electrical substations, grounding systems consist of a grid of interconnected bare cylindrical conductors, horizontally buried and supplemented by rods. Obviously, it is not possible to obtain analytical solutions to problems with this kind of geometry, while the use of standard numerical techniques such as FD or FE should involve a completely out of range computing effort. The authors have developed a BEM numerical formulation for the analysis of grounding systems embedded in uniform and layered soils [1]. Now, we focus our attention on a common and important engineering problem in the grounding field: potential can be transferred to other grounded conductors in the vicinity of the earthing installation, and subsequently it could reach distant points through communication or signal circuits, neutral wires, pipes, rails, or metallic fences. This effect could produce serious safety problems [2] that should be estimated somehow. In this work we present a BEM numerical formulation for the analysis of transferred potentials in grounding installations. The figure shows two non-connected grounding grids (left), and the potential distribution (in kV) on the earth surface (right) when one grid is energized to a Ground Potential Rise of 10 kV and potential is being transferred to the other.



References

[1] I. Colominas, F. Navarrina and M. Casteleiro, "A Boundary Element Numerical Approach for Grounding Grid Computation", *Computer Methods in Applied Mechanics and Engineering*, **174**, 73-90, 1999.

[2] ANSI/IEEE Std.80, *IEEE Guide for safety in AC substation grounding.* IEEE Pub., New York, 1999.