

## ABSTRAK

WILDAN ISTIKLAL.

Penerapan Metode Multi Direct Grounding (MDG) dalam Perbaikan Sistem Pentanahan Listrik Pada Tower Transmisi

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Sistem pentanahan pada tower transmisi merupakan elemen penting dalam menjaga keselamatan dan keandalan operasi sistem tenaga listrik. Nilai resistansi pentanahan yang tinggi pada kaki tower dapat menyebabkan arus gangguan dan arus petir tidak terdistribusi secara optimal ke tanah, sehingga meningkatkan risiko terjadinya back flashover serta gangguan operasional pada jaringan transmisi. Oleh karena itu, diperlukan metode perbaikan sistem pentanahan yang lebih efektif dan terstandarisasi. Penelitian ini membahas rencana penerapan metode **Multi Direct Grounding (MDG)** sebagai upaya perbaikan sistem pentanahan tower transmisi di lingkungan **PT PLN (Persero) UIT JBTB UPT Surabaya**. Metode MDG dilakukan dengan menambahkan beberapa elektroda pentanahan yang terhubung secara langsung dan terdistribusi di sekitar kaki tower. Implementasi MDG di UPT Surabaya direncanakan mulai tahun 2025, namun pada saat penelitian ini dilakukan masih berada pada tahap proses pelaksanaan pekerjaan. Oleh karena itu, analisis kinerja metode MDG dalam penelitian ini dilakukan menggunakan data hasil penerapan MDG dari unit transmisi lain yang telah terlebih dahulu mengimplementasikan metode tersebut, sebagai data pembanding dan simulasi teknis. Pengukuran resistansi pentanahan dilakukan menggunakan **Earth Tester** pada kondisi eksisting tower serta dianalisis kembali berdasarkan hasil pengukuran pasca pemasangan MDG pada unit pembanding. Hasil analisis menunjukkan bahwa nilai resistansi pentanahan awal tower transmisi sebesar **11,8  $\Omega$** , yang belum memenuhi standar teknis PLN. Setelah penerapan metode MDG, nilai resistansi pentanahan menurun menjadi **3,4  $\Omega$** , sehingga telah memenuhi batas standar yang dipersyaratkan ( $\leq 5 \Omega$ ). Penurunan resistansi sebesar **71,2%** menunjukkan bahwa metode MDG efektif dalam menurunkan tahanan pentanahan, mengurangi risiko gangguan akibat petir, serta berpotensi meningkatkan keandalan proteksi dan kontinuitas penyaluran daya pada jaringan transmisi di UPT Surabaya.

**Kata kunci:** Sistem Pentanahan, Multi Direct Grounding, Tower Transmisi, Resistansi Pentanahan, Keandalan Sistem.

## ABSTRACT

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Application of the Multi Direct Grounding (MDG) Method in Repairing Electrical Grounding Systems on Transmission Towers

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The grounding system of transmission towers is a critical component in maintaining the safety and reliability of power system operations. High grounding resistance at tower legs can prevent fault currents and lightning currents from being optimally dissipated into the ground, thereby increasing the risk of back flashover and operational disturbances in transmission networks. Therefore, a more effective grounding improvement method is required. This study discusses the planned implementation of the **Multi Direct Grounding (MDG)** method as an approach to improve the grounding system of transmission towers within **PT PLN (Persero) UIT JBTB UPT Surabaya**. The MDG method involves the installation of multiple grounding electrodes that are directly connected and distributed around the tower legs. The implementation of MDG in UPT Surabaya was planned to begin in 2025; however, at the time this study was conducted, the work was still in the execution process. Consequently, the performance analysis of the MDG method in this study was carried out using post-installation grounding data from other transmission units that had previously implemented MDG, serving as comparative data and technical simulation. Grounding resistance measurements were conducted using an **Earth Tester** under existing tower conditions and further analyzed based on post-MDG installation data from the reference units. The results indicate that the initial grounding resistance of the transmission tower was **11.8  $\Omega$** , which did not comply with PLN technical standards. After the application of the MDG method, the grounding resistance decreased to **3.4  $\Omega$** , meeting the required standard ( $\leq 5 \Omega$ ). This reduction of **71.2%** demonstrates that the MDG method is effective in lowering grounding resistance, reducing the risk of lightning-related disturbances, and potentially improving protection reliability and power transmission continuity in the UPT Surabaya transmission network.

**Keywords:** Grounding System, Multi Direct Grounding, Transmission Tower, Grounding Resistance, System Reliability.