

ABSTRAK

Penelitian ini membahas sistem pondasi Gedung Gardu Elektrifikasi Crane di Belawan, Medan, yang berdiri pada tanah lunak tanpa ditemukan lapisan tanah keras hingga kedalaman ± 60 m. Kondisi tersebut menuntut penggunaan pondasi tiang pancang dalam yang dikaji dari aspek daya dukung aksial dan penurunan (settlement). Analisis dilakukan menggunakan data uji SPT serta pendekatan elastisitas tanah, kemudian diverifikasi dengan pemodelan struktur pada SAP2000. Hasil perhitungan menunjukkan bahwa kapasitas izin tiang tunggal berdiameter 40 cm dan panjang 50 m sebesar 605 kN dengan penurunan ≤ 75 mm, masih dalam batas aman. Untuk kelompok tiang dengan konfigurasi pile cap (PC1) berisi lima tiang, penurunan maksimum tercatat ≤ 125 mm sesuai batas toleransi sistem raft pile. Efisiensi kelompok tiang sebesar 0,80–0,85 menunjukkan distribusi beban merata dan mendekati kapasitas teoritis. Sistem pondasi yang dipilih adalah tiang pancang beton bertulang dengan diameter 40 cm dan panjang 50 m yang diikat tie beam berdimensi 30×50 cm. Analisis slope deflection menunjukkan tie beam mampu mentransfer momen akibat settlement sehingga kestabilan struktur bawah tetap terjaga. Hasil ini menegaskan pentingnya integrasi pile cap dan tie beam untuk mengurangi penurunan diferensial serta memenuhi ketentuan SNI 1726:2019.

Kata Kunci: Beban; Pondasi; Penurunan; Pengikat; Tiang

ABSTRACT

This study discusses the foundation system of the Crane Electrification Substation Building in Belawan, Medan, which stands on soft soil without any hard soil layers found to a depth of ± 60 m. These conditions require the use of deep pile foundations, which are examined in terms of axial bearing capacity and settlement. The analysis was conducted using SPT test data and soil elasticity approaches, then verified through structural modeling in SAP2000. The calculation results indicate that the allowable capacity of a single pile with a diameter of 40 cm and a length of 50 m is 605 kN with settlement ≤ 75 mm, still within safe limits. For the pile group with a pile cap (PC1) configuration containing five piles, the maximum settlement recorded was ≤ 125 mm, within the tolerance limits of the raft pile system. The pile group efficiency of 0.80–0.85 indicates even load distribution and is close to the theoretical capacity. The selected foundation system consists of reinforced concrete piles with a diameter of 40 cm and a length of 50 m, connected by tie beams with dimensions of 30×50 cm. Slope deflection analysis shows that the tie beams can transfer the moments caused by settlement, thereby maintaining the stability of the lower structure. These results emphasize the importance of integrating pile caps and tie beams to reduce differential settlement and comply with SNI 1726:2019 standards.

Keywords: *Load; Foundation; Settlement; Fastener; Pole.*