INTISARI

Jalan Tol Akses Patimban memiliki peran penting untuk menghubungkan Pelabuhan Patimban dengan Jalan Tol Trans Jawa Cikopo–Palimanan sehingga dapat membantu Pelabuhan Tanjung Priok melayani arus logistik barang di sebelah timur Jakarta. Pada konstruksi jalan tol tersebut, terdapat struktur jembatan tipe *slab on pile* yang ditumpu oleh fondasi tiang pancang dengan diameter 0,6 meter dan menancap sedalam 21 meter ke tanah dominan lempung berkonsistensi *firm to stiff*. Struktur tersebut melintasi Sungai Cipunagara yang mengalami banjir pada awal 2024 dan diperkirakan akan kembali meluap apabila terjadi hujan berintensitas tinggi. Penelitian ini bertujuan mengevaluasi perilaku fondasi tiang pancang terhadap beban aksial maupun lateral, serta mengkaji pengaruh luapan Sungai Cipunagara terhadap deformasi tiang. Evaluasi dilakukan melalui metode analitis dan numeris berdasarkan pada nilai *N*-SPT untuk mengestimasi kapasitas dukung dan deformasi tiang. Kapasitas dukung aksial dianalisis menggunakan metode Meyerhof (1976), Briaud dkk. (1985), dan Decourt (1987). Untuk kapasitas dukung dan deformasi lateral tiang tunggal digunakan metode Broms (1964), sedangkan penurunan tiang tunggal dievaluasi berdasarkan metode Vesic (1977) dan Bowles (1997), serta Vesic (1969) untuk penurunan kelompok tiang. *Software* RSPile dimanfaatkan untuk mengestimasi deformasi tiang secara numeris. Hasil analisis dibandingkan dengan data uji lapangan, yaitu uji *Pile Driving Analyzer* (PDA). Hasil evaluasi menunjukkan fondasi tiang aman dalam menahan beban aksial maupun lateral. Hal tersebut ditunjukkan melalui nilai faktor aman yang memenuhi syarat dan deformasi tiang yang berada dalam batas diizinkan. Kenaikan muka air tanah hingga muka air banjir berpengaruh terhadap deformasi tiang secara lateral, tetapi dampaknya tidak signifikan. Dari beberapa metode yang digunakan, Decourt (1987) memberikan nilai kapasitas dukung yang interval selisihnya paling mendekati uji PDA, sedangkan pada penurunan tiang, metode Vesic (1977) mempunyai selisih terkecil terhadap uji lapangan. Hasil ini dapat menjadi acuan dalam perencanaan fondasi jembatan *slab on pile* pada daerah yang berisiko banjir, khususnya dengan karakteristik tanah serupa.

Kata kunci: tiang pancang; *slab on pile*; kapasitas dukung; deformasi tiang; *pile driving analyzer* (PDA).

ABSTRACT

Patimban Access Toll Road played a crucial role in connecting Patimban Port to the Trans-Java Toll Road Cikopo–Palimanan, thereby supporting Tanjung Priok Port in handling logistics flow in the eastern region of Jakarta. The toll road construction consists a slab on pile bridge structure which supported by driven pile foundations who had a diameter of 0,6 meters and were embedded 21 meters deep into a clay layer with a firm to stiff consistency. However, the structure crossed the Cipunagara River, which experienced flooding in early 2024 and was predicted to overflow again during high-intensity rainfall. This study aimed to evaluate the behavior of pile foundations under axial and lateral loads and to analyze the impact of the Cipunagara River overflow on pile deformation. The evaluation was conducted using analytical and numerical methods based on N-SPT values to estimate the bearing capacity and deformation of the piles. Axial bearing capacity was analyzed using the methods of Meyerhof (1976), Briaud et al. (1985), and Decourt (1987). For lateral bearing capacity and deformation of single piles, the Broms (1964) method was applied. Settlement of single piles was evaluated using the Vesic (1977) and Bowles (1997) methods, while group pile settlement was analyzed using Vesic (1969). The RSPile software was utilized to numerically estimate pile deformation. The results of the analysis were compared with field testing data from the Pile Driving Analyzer (PDA). The evaluation results showed that the pile foundation was safe in resisting both axial and lateral loads. This was indicated by safety factors meeting the required standards and deformations remaining within permissible limits. The rise of the groundwater level to flood elevation affected the lateral deformation of the piles, but the impact was not significant. Among the methods used, Decourt (1987) produced bearing capacity values most closely matching the PDA test results, while Vesic (1977) yielded the smallest deviation in settlement analysis. These findings could serve as a reference in the design of slab-on-pile bridge foundations in flood-prone areas with similar soil conditions.

Keywords*: pile foundation; slab on pile; bearing capacity, pile deformation; Pile Driving Analyzer (PDA).*