INTISARI

Tenggelamnya Jakarta yang memiliki signifikansi tinggi bagi Indonesia telah menjadi momok bagi warga Jakarta dan pemerintah. Banjir rob yang kian parah menyapu pesisir Teluk Jakarta sudah cukup menjadi bukti skala kekritisan masalah ini. Salah satu daerah yang kerap kali terendam banjir rob adalah Kelurahan Dadap yang terletak di bantaran Kali Dadap yang bermuara langsung di Teluk Jakarta. Pembangunan Tanggul Kali Dadap merupakan jawaban pemerintah demi melindungi kawasan Kelurahan Dadap yang lebih rendah dari permukaan air pasang tinggi sebelum menyebabkan korban lebih banyak. Namun, deformasi yang terjadi di beberapa titik tanggul yang baru saja dibangun memantik keraguan di benak warga Kelurahan Dadap apakah mereka bisa mengandalkan tanggul ini.

Dalam penelitian ini, dilakukan analisis stabilitas struktur penahan tanah tanggul *existing* dan alternatif Kali Dadap menggunakan metode analitis dan numeris berdasarkan kriteria SNI 8460:2017 tentang persyaratan perancangan geoteknik. Metode analitis kondisi beban statis yang digunakan dalam penelitian adalah metode tekanan tanah lateral Rankine (1857), Coulomb (1776), dan *log-spiral* Caquot-Kerisel (1948), dengan metode analitis kondisi beban dinamis digunakan metode pseudostatik Mononobe-Okabe (1926). Sedangkan analisis metode numeris kondisi beban statis dan kondisi beban dinamis dilakukan menggunakan perangkat lunak Geo5 dengan program Sheeting Check dan Slope Stability. Metode-metode analitis kondisi beban statis juga kemudian dibandingkan untuk dinilai kekonservatifitasan setiap metode.

Hasil analisis menunjukkan bahwa struktur penahan tanah tanggul *existing* tidak aman terhadap kriteria SNI 8460:2017 pada kondisi beban statis maupun kondisi beban dinamis. Nilai defleksi maksimum yang dihasilkan pada metode numeris kondisi beban statis sebesar 83 mm melewati batas defleksi maksimum yang disyaratkan pada SNI 8460:2017 sebesar 60 mm. Pada kondisi beban dinamis, struktur penahan tanah tanggul *existing* mengalami kegagalan secara keseluruhan pada metode numeris, sehingga dipastikan tidak memenuhi kriteria SNI 8460:2017. Hasil analisis juga menunjukkan bahwa struktur penahan tanah tanggul alternatif tidak aman terhadap kriteria SNI 8460:2017 pada kondisi beban statis maupun kondisi beban dinamis. Nilai faktor aman kapasitas dukung tanah yang dihasilkan pada seluruh metode tekanan tanah lateral pada metode analitis kondisi beban statis berada di bawah faktor aman minimum yang ditetapkan SNI 8460:2017. Pada kondisi beban dinamis, nilai faktor aman kapasitas dukung tanah yang dihasilkan pada seluruh metode tekanan tanah lateral pada metode analitis berada di bawah faktor aman minimum yang ditetapkan SNI 8460:2017 . Perbandingan konservatifitas metode analitis kondisi beban statis menunjukkan bahwa metode tekanan tanah lateral Rankine (1857) merupakan metode yang paling konservatif untuk analisis stabilitas struktur penahan tanah, diikuti metode *log-spiral* Caquot-Kerisel (1948), dan yang paling tidak konservatif adalah metode Coulomb (1776).

Kata kunci: Beban statis, Beban dinamis, Faktor aman, Konservatifitas, Geo5

ABSTRACT

The subsidence of Jakarta, which holds significant importance for Indonesia, has become a pressing concern for the residents of Jakarta and the government. The increasingly severe tidal floods that inundate the Jakarta Bay coast are sufficient evidence of the critical scale of this problem. One area that is frequently submerged by tidal floods is Dadap Village, located along the banks of the Dadap River, which directly flows into Jakarta Bay. The construction of the Dadap River Embankment represents the government's effort to protect the Dadap Village area, which is lower than the high tide level, before it causes more casualties. However, deformations occurring at several points of the newly built embankment have raised doubts among the residents of Dadap Village about whether they can rely on this embankment.

In this study, stability analyses were conducted on the existing and alternative embankment soil retaining structures of the Dadap River using both analytical and numerical methods based on the criteria of SNI 8460:2017 on geotechnical design requirements. The analytical methods under static load conditions employed in this study include the Rankine (1857), Coulomb (1776), and log-spiral Caquot-Kerisel (1948) lateral earth pressure methods, with the Mononobe-Okabe (1926) pseudo-static method used for dynamic load conditions. Meanwhile, numerical analysis under both static and dynamic load conditions was performed using Geo5 software with the Sheeting Check and Slope Stability programs. The analytical methods for static load conditions were also compared to evaluate the conservativeness of each method.

The results of the analysis indicate that the existing embankment soil retaining structure is not safe according to the SNI 8460:2017 criteria under both static and dynamic load conditions. The maximum deflection value obtained from the numerical method under static load conditions was 83 mm, exceeding the maximum deflection limit of 60 mm prescribed by SNI 8460:2017. Under dynamic load conditions, the existing embankment soil retaining structure experienced overall failure in the numerical method, thus failing to meet the SNI 8460:2017 criteria. The analysis results also show that the alternative embankment soil retaining structure is not safe according to the SNI 8460:2017 criteria under both static and dynamic load conditions. The safety factor values of soil bearing capacity obtained from all lateral earth pressure methods in the analytical method under static load conditions were below the minimum safety factor required by SNI 8460:2017. Under dynamic load conditions, the safety factor values of soil bearing capacity obtained from all lateral earth pressure methods in the analytical method were below the minimum safety factor required by SNI 8460:2017. The comparison of conservativeness of the analytical methods under static load conditions shows that the Rankine (1857) lateral earth pressure method is the most conservative for stability analysis of soil retaining structures, followed by the log-spiral Caquot-Kerisel (1948) method, and the least conservative is the Coulomb (1776) method.

Keywords: *Static load, Dynamic load, Safety factor, Conservativeness, Geo5*