PENENTUAN JARAK AMAN OPERASIONAL ALAT BERAT EXCAVATOR TERHADAP DINDING PENAHAN TANAH BERDASARKAN ANALISIS STABILITAS MENGGUNAKAN PLAXIS (*Studi kasus: Konstruksi kanal di Batam*)

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ABSTRAK

Modernisasi sektor konstruksi meningkatkan penggunaan alat berat untuk mendukung efisiensi pekerjaan, namun beban tambahan (*surcharge load*) dari alat berat yang beroperasi di dekat dinding penahan tanah (DPT) dapat menurunkan stabilitas struktur. Permasalahan ini terjadi pada konstruksi kanal di Kota Batam, tepatnya pada STA 0+220 – 0+230, di mana DPT mengalami kemiringan selama pelaksanaan konstruksi. Penelitian ini bertujuan untuk mengetahui faktor keamanan DPT pada kondisi awal, menganalisis pengaruh beban *Excavator* Hyundai R140LC-9S terhadap stabilitas, serta menentukan jarak aman minimum *Excavator*.

Analisis dilakukan melalui perhitungan stabilitas guling, geser, kapasitas dukung secara manual menggunakan persamaan geoteknik, serta analisis numerik menggunakan PLAXIS.

Hasil penelitian menunjukkan bahwa kondisi awal memenuhi persyaratan keamanan dengan faktor keamanan global PLAXIS sebesar 2,076, sedangkan hasil perhitungan manual menghasilkan faktor keamanan guling 2,216, geser 1,724, kapasitas dukung DPT 4,245. Pemberian beban *Excavator* menurunkan faktor keamanan, dengan nilai PLAXIS sebesar 1,472 pada jarak 2 m, 1,553 pada 2,5 m, dan 1,593 pada 3 m. Berdasarkan hasil analisis menggunakan PLAXIS, jarak aman minimum operasional *Excavator* adalah 2,5 m, sedangkan perhitungan manual memberikan rekomendasi yang lebih konservatif yaitu 4 m.

Kata kunci : Dinding Penahan Tanah, *Excavator*, Faktor Keamanan, PLAXIS

DETERMINATION OF SAFE OPERATIONAL DISTANCE FOR EXCAVATORS FROM RETAINING WALLS BASED ON STABILITY ANALYSIS USING PLAXIS (Case Study: Canal Construction in Batam)

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ABSTRACT

The modernization of the construction industry has increased the use of heavy equipment to improve work efficiency. However, the additional surcharge load generated by heavy equipment operating near a retaining wall may reduce the structural stability. This issue occurred during the canal construction project in Batam City, specifically at STA 0+220 – 0+230, where the retaining wall experienced tilting during construction. This study aims to determine the safety factor of the retaining wall under its initial condition, analyze the effect of the Hyundai R140LC-9S Excavator load on the wall stability, and determine the minimum safe distance of the Excavator.

The analysis was conducted through manual calculations of overturning stability, sliding stability, and bearing capacity using geotechnical equations, as well as numerical analysis using PLAXIS.

The results indicate that the initial condition satisfies the required safety criteria, with a global safety factor of 2.076 obtained from PLAXIS, while the manual calculations produced safety factors of 2.216 for overturning, 1.724 for sliding, and 4.245 for bearing capacity. The excavator load reduced the safety factor, with PLAXIS results of 1.427 at a distance of 2 m, 1.553 at 2.5 m, and 1.593 at 3 m. Based on the PLAXIS analysis, the minimum safe operating distance of the excavator is 2.5 m, whereas the manual calculations provide a more conservative recommendation of 4 m.

***Keyword** : Excavator, PLAXIS , Retaining Wall, Safety Factor.*