INTISARI

Semi basemen adalah jenis basemen yang sebagian ruangannya berada di atas muka tanah dan sebagian lain berada di bawah muka tanah. Ruang tersebut memerlukan galian yang didukung oleh dinding penahan tanah. Pada proyek pembangunan kantor di Maguwoharjo, Yogyakarta membutuhkan galian sedalam 3,05 m. Dinding penahan tanah terdiri dari 2 lapisan, yaitu dinding penahan tanah sementara tebal 0,1 m dan dinding penahan tanah permanen tebal 0,2 m. Kondisi tanah di lokasi penelitian didominasi tanah kepasiran yang dikenal memiliki kuat geser yang tinggi sehingga dapat memberikan nilai faktor aman yang tinggi pula pada desain dinding penahan tanah. Berdasarkan SNI 8460:2017, dinding penahan tanah permanen masih memiliki ketebalan yang relatif tipis untuk dinding struktural. Berdasarkan permasalahan tersebut, diperlukan pengkajian ulang pada desain rencana. Tugas Akhir ini bertujuan untuk melakukan optimasi desain ketebalan berdasarkan SNI 8460:2017 dan modifikasi kedalaman tiang bor agar mendapatkan desain yang lebih optimal.

Analisis numeris dilakukan pada 3 segmen dinding penahan tanah yang berada di sisi dekat bangunan satu lantai eksisting menggunakan perangkat lunak Plaxis v8.6 yang divalidasi dengan metode *ultimate-strength* berdasarkan SNI 2847:2019 dan kondisi lapangan. 4 pilihan desain, yaitu dinding penahan tanah sementara tebal 0,1 m+ kedalamanan tiang bor 10,764 m (model A), dinding penahan tanah tebal 0,1 m+dinding penahan tanah permanen 0,2 m+kedalamanan tiang bor 10,764 m (model B), dinding penahan tanah sementara tebal 0,1 m+dinding penahan tanah permanen tebal 0,3 m+ kedalamanan tiang bor 10,764 m (model C), dan dinding penahan tanah sementara tebal 0,1 m+dinding penahan tanah permanen tebal 0,3 m+modifikasi kedalaman tiang bor 10 m (model D) disimulasikan untuk mendapat desain yang optimal.

Berdasarkan analisis Plaxis, kondisi eksisting diperoleh SF_{statis} dan SF_{gempa} masing-masing sebesar 1,0538 dan 1,0272 pada dinding penahan tanah sementara tebal 0,1 m+kedalamanan tiang bor 10,764 m (model A) serta SF_{statis} dan SF_{gempa} masing-masing sebesar 1,5574 dan 1,1513 pada dinding penahan tanah sementara tebal 0,1 m+dinding penahan tanah permanen tebal 0,2 m+kedalaman tiang bor 10,764 m (model B). Pada dinding penahan tanah sementara tebal 0,1 m+dinding penahan tanah permanen tebal 0,3 m+kedalaman tiang bor 10,764 m (model C) diperoleh SF_{statis} dan SF_{gempa} masing-masing sebesar 1,6303 dan 1,1837. Pada dinding penahan tanah sementara tebal 0,1 m+dinding penahan tanah permanen tebal 0,3 m+modifikasi kedalaman tiang bor 10 m (model D) diperoleh SF_{statis} dan SF_{gempa} masing-masing sebesar 1,5393 dan 1,1528. Hasil analisis Plaxis yang divalidasi menggunakan metode *ultimate-strength* menunjukkan bahwa model A tidak memenuhi syarat faktor aman, kuat lentur, dan defleksi struktur sehingga memerlukan sistem penunjang berupa *rakers* sederhana untuk memberikan tambahan stabilitas galian. Model B, C, dan D masih memenuhi syarat faktor aman, kuat lentur, kuat geser, dan defleksi struktur. Penelitian ini menghasilkan keputusan bahwa dinding penahan tanah sementara tebal 0,1 m+dinding penahan tanah permanen tebal 0,3 m+modifikasi kedalaman tiang bor 10 m (model D) merupakan desain yang lebih optimal.

Kata kunci: Optimasi, dinding penahan tanah, tanah kepasiran, semi basemen, simulasi numeris

ABSTRACT

Semi basement is a type of basement which part of the room is above the ground and the other part is below the ground. It requires excavation that supported by a retaining wall. The office construction project in Maguwoharjo, Yogyakarta requires excavations with a depth of 3.05 m. The retaining wall consists of 2 layers, namely a temporary retaining wall with thickness of 0.1 m and a permanent retaining wall with thickness of 0.2 m. Soil conditions at the research site are dominated by sandy soil which known to have high shear strength properties so that they can provide a high safety factor value in the design of retaining walls. Based on SNI 8460:2017, retaining wall still have a relatively thin for structural wall. Considering those problems, a review design is needed. This study aims to optimize the thickness design based on SNI 8460:2017 and modification of bored pile depth in order to get more optimal design.

Numerical analysis was carried out on 3 segments of retaining wall located near the existing ome-story building using Plaxis v8.6 software which was validated by ultimate-strength method based on SNI 2847:2019 and field conditions. Four designs options, temporary retaining wall with thickess of 0.1 m+bore pile depth of 10.764 m (model A), temporary retaining wall with thickness of 0.1 m+permanent retaining wall with thickness of 0.2 m+bore pile depth of 10.764 m (model B), temporary retaining wall with thickness of 0.1 m+permanent retaining wall with thickness of 0.3 m+bore pile depth of 10.764 m (model C), and temporary retaining wall with thickness of 0.1 m+permanent retaining wall with thickness of 0.3 m+modified bore pile depth of 10 m (model D) were simulated to obtain the optimal design.

Based on Plaxis analysis, the exsisting conditions obtained that SF_{static} and $SF_{earthquake}$ of 1.0538 and 1.0272 on the temporary retaining wall with thickess of 0.1 m+bore pile depth of 10.764 m (model A) and SF_{static} and $SF_{earthquake}$ of 1.5574 and 1.1513 on the temporary retaining wall with thickness of 0.1 m+permanent retaining wall with thickness of 0.2 m+bore pile depth of 10.764 m (model B). SF_{static} dan *$SF_{earthquake}$ were 1.6303 and 1.1837 for the temporary retaining wall with thickness of 0.1 m+permanent retaining wall with thickness of 0.3 m+bore pile depth of 10.764 m (model C). SF_{static} and $SF_{earthquake}$ were 1.6303 and 1.1837 for the temporary retaining wall with thickness of 0.1 m+permanent retaining wall with thickness of 0.3 m+modified bore pile depth of 10 m (model D). The result of Plaxis analysis which were validated using ultimate-strength method showed that model A did not meet the requirements for safety factor, flexural strength, and structural deflection so that it required a support system like simple rakers to provide additional excavation stability. Model B, C, and D still meet the requirements for safety factor, flexural strength, shear strength, and structural deflection. This study resulted in a decision that temporary retaining wall with thickness of 0.1 m+permanent retaining wall with thickness of 0.3 m+modified bore pile depth of 10 m (model D) is the more optimal design.*

***Keywords**: Optimization, retaining wall, sandy soil, semi basement, numerical simulation*