

INTISARI

Balai Besar Pelaksanaan Jalan Nasional Jawa Tengah-Daerah Istimewa Yogyakarta (BBPJN Jateng-DIY) merencanakan pembangunan *underpass* untuk mengatasi kemacetan lalu lintas di Simpang Kentungan. Setelah 3 tahun beroperasi, terdapat permasalahan pada *Underpass* Kentungan berupa adanya rembesan air di suatu titik antara STA 0+600 sampai STA 0+650 pada dinding *secant pile* sisi utara *underpass*. Rembesan tersebut dimungkinkan terjadi karena muka air tanah eksisting berada pada kedalaman 4 m dari permukaan tanah (lebih dangkal daripada elevasi dasar *underpass*). Oleh karena itu, penelitian ini dilakukan untuk menurunkan muka air tanah pada struktur *secant pile* melalui modifikasi sistem drainase regional sekitar *Underpass* Kentungan.

Pada penelitian ini ditetapkan 2 alternatif muka air tanah rencana yang berada di bawah batas penggalian yaitu kedalaman 8 m dan 11 m dari permukaan tanah. Defleksi dan gaya-gaya dalam *secant pile* pada masing-masing kedalaman muka air tanah dianalisis menggunakan Plaxis 2D versi 8.6 pada masa layan dan ketika terjadi gempa. Selain itu, dilakukan analisis manual untuk mencari kapasitas dukung aksial *secant pile* menggunakan teori Reese dan O'Neill (1989), serta analisis keruntuhan menurut Ou (2006). Hasil analisis manual divalidasi dengan perangkat lunak spColumn versi 6. Dilakukan pula pengamatan kondisi eksisting sistem drainase regional sekitar *Underpass* Kentungan untuk menentukan kelayakannya dalam mengakomodasi air hujan berdasarkan data curah hujan harian maksimal 20 tahun terakhir.

Berdasarkan hasil analisis diperoleh informasi bahwa terdapat pengurangan defleksi dan gaya-gaya dalam *secant pile* akibat penurunan muka air tanah, namun tidak terlalu signifikan. Penurunan muka air tanah sebesar 4 m dan 7 m dapat meningkatkan kapasitas dukung aksial *secant pile* masing-masing sebesar 7,22% dan 11,93%. Kondisi eksisting sistem drainase regional sekitar *Underpass* Kentungan kurang baik, sehingga perlu dilakukan optimalisasi saluran drainase eksisting dan membangun sistem drainase *dual channeling*.

Kata kunci: muka air tanah tinggi, *secant pile*, Plaxis 2D, kapasitas dukung aksial, sistem drainase regional.

ABSTRACT

The Central Java Special Region of Yogyakarta National Road Implementation Center (BBPJKN Jateng-DIY) planned the construction of an underpass to handle traffic congestion at Kentungan Intersection. After operating for 3 years, there is a problem with the Kentungan Underpass due to water seepage at a point between STA 0+600 to STA 0+650 on the secant pile wall on the north side of the underpass. The seepage is possibly due to the existing groundwater table located at a depth of 4 m from the ground surface (shallower than the underpass base elevation). Hence, this study was conducted to lower the groundwater level at the secant pile structure through modification of the regional drainage system around the Kentungan Underpass.

In this study, two alternative groundwater levels were set below the excavation limit, at depths of 8 m and 11 m from the ground surface. The deflection and inner forces of the secant pile at each depth of the water table were analyzed using Plaxis 2D version 8.6 for service conditions and during an earthquake. In addition, a manual analysis was conducted to find the axial bearing capacity of secant pile using Reese and O'Neill (1989) theory, as well as collapse analysis according to Ou (2006). The results of the manual analysis were validated with spColumn software version 6. The existing condition of the regional drainage system around the Kentungan Underpass was investigated to assess its ability to accommodate rainwater based on the last 20 years of precipitation records.

Based on the analysis, it was found that the deflection and forces in the secant pile were lowered due to the reduction of groundwater level, but not very significant. A decrease in groundwater level by 4 m and 7 m can improve the axial bearing capacity of secant pile by 7,22% and 11,93%, respectively. The existing condition of the regional drainage system around the Kentungan Underpass is not good, so it is necessary to optimize the existing drainage channels and develop a dual channeling drainage system.

Keywords: *high groundwater table, secant pile, Plaxis 2D, axial bearing capacity, regional drainage system.*