

Jalan Tol Solo Yogyakarta Kulon Progo merupakan salah satu sarana untuk mempermudah akses menuju Kota Yogyakarta dari Kota Solo dan dari Kabupaten Kulon Progo. Desain kecepatan rencana yang cukup tinggi perlu adanya keselamatan dan kenyamanan pengguna jalan untuk dipertimbangkan. Kerusakan permukaan jalan dapat menghambat laju lalu lintas dan kenyamanan dalam berkendara. Jalan tol ini berada didekat Sesar Opak yang memiliki potensi sebagai salah satu sumber gempa. Tujuan penelitian ini untuk mengetahui potensi likuefaksi, pengaruh beban gempa, mengetahui perilaku timbunan terhadap likuefaksi, model tanah untuk likuefaksi dan mitigasi likuefaksi pada timbunan.

Penelitian ini dilakukan pada pembangunan Jalan Tol Solo Yogyakarta Kulonprogo Seksi 1.1 pada STA 22+300 berupa timbunan jalan dengan tinggi kurang lebih 7 meter. Perhitungan potensi likuefaksi dilakukan dengan metode *simplified procedure* dan numeris dengan variasi beban gempa. Analisis pengaruh likuefaksi terhadap timbunan dilakukan secara numeris 2D dengan program *Midas Gts Nx*. Lapisan tanah terlikuefaksi digunakan model *UBC sand* dan model *residual shear strength*. Hasil analisis numeris ini akan ditinjau *pore pressure ratio*, perilaku *displacement* dan nilai regangan. Mitigasi timbunan akan diperlukan apabila didapatkan hasil *displacement* mengakibatkan kerusakan badan jalan yang signifikan.

Hasil analisis numeris didapatkan nilai *pore pressure ratio* mencapai 1,0 pada lapisan pasir lepas yang menandakan likuefaksi terjadi. *Displacement* yang terjadi akibat likuefaksi didapatkan sekitar 35 cm pada badan jalan dan sekitar 70 cm pada kaki timbunan. Mitigasi dengan *deep cement mixing* digunakan untuk memperkuat lapisan tanah. *Deep cement mixing* yang ditempatkan di bawah timbunan tanah secara menerus mampu mengurangi dampak likuefaksi. Hasil perkuatan dengan *deep cement mixing* didapatkan vertikal *displacement* sekitar 4 cm.

**Kata kunci:** Likuefaksi, *pore pressure ratio*, *midas gts nx*, *UBCsand*, *deep cement mixing*

*Solo Yogyakarta Kulon Progo Toll Road is one of facilitate to access Yogyakarta City from Solo City and from Kulon Progo Regency. The design of a criteria speed that is high enough requires road safety and comfort to be considered. Damage of road surface can distrubing traffic flow and driving comfort. This toll road is near the Opak Fault which has the potential as a source of earthquake. The purpose of this study was to determine the potential for liquefaction, the effect of earthquake loads, to determine the behavior of embankments on liquefaction, soil models for liquefaction and mitigation of liquefaction on embankments.*

*This research is located on the construction of the Solo Yogyakarta Kulonprogo Toll Road Section 1.1 at STA 22+300 which a road embankment with a height of approximately 7 meters. Calculation of potential liquefaction is carried out using the simplified procedure and numerical method with various seismic load. Analysis of the effect of liquefaction on the embankment was carried out numerically in 2D using the Midas Gts Nx program. The liquefied soil layers used the UBC sand model and the residual shear strength model. The results of this numerical analysis will review the pore pressure ratio, displacement behavior and strain values. Mitigation of embankments will be required if displacements result in significant road damage.*

*The results of the numerical analysis showed that the pore pressure ratio reached 1.0 in the loose sand layer, which indicated that liquefaction had occurred. Displacement that occurred due to liquefaction was found to be around 35 cm at the road and around 70 cm at the side of the embankment. Mitigation with deep cement mixing is used to strengthen the soil layer. Deep cement mixing which is placed under the pile of soil continuously can reduce the impact of liquefaction. The results of strengthening with deep cement mixing obtained a vertical displacement of about 4 cm.*

**Keywords:** *Liquefaction, pore pressure ratio, midas gts nx, UBCsand, deep cement mixing*