ABSTRAK

Kalla Toyota merupakan perusahaan yang bergerak di bidang otomotif pemilik hak distribusi kendaraan Toyota di wilayah Sulawesi bagian selatan. Pembangunan *outlet* Kalla Toyota Juanda di Jl. Juanda No. 45, Kec. Ulujadi, Kota Palu, Sulawesi Tengah diperlukan untuk memperluas jaringan distribusi bisnis. Proyek ini terletak di dekat Sesar Palu-Koro dengan stratifikasi tanah pasir formasi Endapan Pantai dan Aluvium yang berpotensi untuk terjadi likuefaksi, terlebih lagi di tahun 2018 terjadi bencana gempa bumi berkekuatan 7,7 M yang memicu tsunami di wilayah Pantai Donggala dan Pantai Talise. Namun, desain fondasi dangkal yang digunakan kurang sesuai untuk bangunan komersial di wilayah yang berpotensi likuefaksi

Perencanaan struktur fondasi perlu mempertimbangkan kondisi geoteknik baik sifat dan perilaku tanah maupun parameter gempa di lokasi proyek. Hasil penyelidikan tanah BH-01 di Area Proyek Kalla Toyota Juanda membuktikan bahwa kondisi tanah berupa tanah pasir dengan kepadatan relatif sedang – padat, muka air tanah yang dangkal, dan kandungan *fines content* sebesar 6,89% yang rentan likuefaksi. Terlebih lagi, Kota Palu merupakan zona rawan gempa dengan prediksi gempa bumi maksimum sebesar 7,94 M dengan percepatan tanah dasar 0,6*g* Berdasarkan analisis potensi likuefaksi metode *simplified procedure* dengan gempa tersebut tanah di lapisan 6 – 12 m dan 16 – 20 m, khususnya lapisan 10 m berpotensi likuefaksi dengan nilai *liquefaction potential index* (LPI) sebesar 8,19 yang dengan tingkat kerentanan tinggi. Salah satu dampak likuefaksi adalah penurunan tanah yang diestimasikan sebesar 13,25 cm yang diklasifikasikan tingkat risiko kerusakan sedang yang dapat mempengaruhi struktur dan fungsi bangunan.

Alternatif desain fondasi tiang bor dilakukan karena kekuatan tumpu di ujung tiang yang dianalisis berdasarkan kondisi ekstrem (likuefaksi) yang dipengaruhi tahanan gesek negatif. Berdasarkan hasil analisis daya dukung tiang tunggal, tiang bor diameter 600 mm di kedalaman 13 m memenuhi persyaratan izin *safety factor*, tahanan lateral, defleksi tiang vertikal, dan penurunan segera.

Kata kunci: likuefaksi, *liquefaction potential index*, penurunan tanah, kegempaan, fondasi tiang bor.

ABSTRACT

Kalla Toyota is an automotive company that holds the distribution rights for Toyota vehicles in the southern region of Sulawesi. The Kalla Toyota Juanda outlet is constructed at Juanda Street No. 45, Ulujadi District, Palu City, Central Sulawesi is needed to expand its distribution network. This project is located near the Palu-Koro Fault, with sand soil stratification consisting of coastal deposit and alluvium formations, which have the potential for liquefaction. This risk is further emphasized by the 7.7-magnitude earthquake in 2018, which triggered a tsunami along the Donggala and Talise coasts. However, the shallow foundation design used is less suitable for commercial buildings in liquefaction-prone areas.

The foundation structure design must consider geotechnical conditions, including soil properties, behavior, and seismic parameters at the site. Soil investigation results from BH-01 in the Kalla Toyota Juanda Project Area indicate that the soil consists of sand with medium to dense relative density, shallow groundwater levels, and a fines content of 6.89%, making it vulnerable to liquefaction. Moreover, Palu City is located in an earthquake-prone zone, with a predicted maximum earthquake magnitude of 7.94 M and a peak ground acceleration (PGA) of 0.6g. Based on liquefaction potential analysis using the simplified procedure method, soil layers at depths of 6 – 12 meters and 16 – 20 meters, especially soil layers at depth of 10 meters have liquefaction potential, with a highest liquefaction potential index (LPI) of 8.19, indicating a high susceptibility level. One of the effects of liquefaction is ground settlement, which is estimated at 13.25 cm, classified as a moderate risk level that could affect the structure and function of the building.

As an alternative, a bored pile foundation design was considered due to its bearing capacity at the pile tip, which was analyzed under extreme conditions (liquefaction) and affected by negative skin friction. The single pile bearing capacity analysis, a 600 mm diameter bored pile at a depth of 13 meters meets the safety factor requirements, lateral resistance, vertical pile deflection, and immediate settlement.

Keyword: Liquefaction, liquefaction potential index, post-liquefaction settlement, earthquake, bored pile