

INTISARI

Fenomena likuefaksi di Provinsi D.I.Yogyakarta mulai diperhatikan dan banyak dikaji setelah terjadinya gempa bumi pada 27 Mei 2006. Indonesia terletak di antara 3 pertemuan lempeng tektonik yang sangat aktif. Ketiga lempeng itu adalah lempeng Eurasia, lempeng Australia, dan lempeng Pasifik. D.I. Yogyakarta terletak pada zona subduksi lempeng Indo-Australia dan lempeng Eurasia yang dikenal dengan *The Java Megathrust* sehingga berpotensi mengalami gempa bumi. Tujuan dari penelitian ini adalah menganalisis potensi likuefaksi, kapasitas dukung fondasi, penurunan fondasi gedung SGLC FT UGM, dan rekomendasi kestabilan sistem fondasi akibat adanya likuefaksi.

Penelitian ini dilakukan pada pembangunan Gedung SGLC (*Smart Green Learning Center*) yang berada di area Fakultas Teknik, Kabupaten Sleman, Yogyakarta. Gedung ini terdiri dari 11 lantai dan 1 *basement*. Nilai PGA (*Peak Ground Acceleration*) berdasarkan peta gempa bumi Indonesia (2017) yang dikeluarkan oleh Pusat Studi Gempa Nasional untuk probabilitas kejadian 2% dalam 50 tahun. Perhitungan analisis potensi likuefaksi dilakukan secara numeris dengan perangkat lunak *Settle 3D*. Untuk menganalisis kapasitas dukung dan penurunan fondasi gedung SGLC FT UGM tanpa pengaruh likuefaksi dan setelah terpengaruh likuefaksi menggunakan *Geo5*.

Terdapat 2 titik bor pada area gedung SGLC yaitu titik B1 dan titik B2 dengan jenis tanah pasir dan muka air tanah berada di kedalaman 6 meter. Hasil perhitungan secara numeris menggunakan *Settle 3D* menunjukkan pada titik B1 likuefaksi berada di kedalaman 8-14 meter dan pada titik B2 pada kedalaman 8-22 meter. Kapasitas dukung vertikal kelompok tiang tipe *pile cap* F3, F4, dan F5 disekitar titik B2 kondisi 1 dan kondisi 2 masih mampu menahan gaya aksial yang diterima, namun tidak dengan kondisi 3. Penurunan maksimum yang terjadi pada kelompok tiang tipe *pile cap* F3, F4, dan F5 titik B2 kondisi 1 dan 2 masih memenuhi persyaratan, namun pada kondisi 3 tidak memenuhi. Saat likuefaksi bekerja penuh atau nilai *friction angle* bernilai 0, diusulkan perbaikan dengan analisis kondisi 4 yaitu dengan menambah panjang tiang yang semula 20 meter menjadi 21 meter pada tipe *pile cap* F4 dan menjadi 21,5 meter pada tipe *pile cap* F3 & F5.

Kata kunci : Likuefaksi, Fondasi Tiang Bor, Kapasitas Dukung Fondasi, Simulasi Numeris, Tanah Pasiran

ABSTRACT

The phenomenon of liquefaction in D.I.Yogyakarta Province began to be noticed and studied a lot after the earthquake on 27 May 2006. Indonesia is located between 3 very active tectonic plate encounters. The three plates are the Eurasian plate, the Australian plate, and the Pacific plate. D.I. Yogyakarta is located in the subduction zone of the Indo-Australian plate and the Eurasian plate, known as The Java Megathrust, so it has the potential to experience earthquakes. The purpose of this study is to analyze the potential for liquefaction, the bearing capacity of the foundation, and the settlement of the foundation of the SGLC FT UGM building, as well as recommendations for the stability of the foundation system due to liquefaction.

This research was conducted on the construction of the SGLC (Smart Green Learning Center) building located in the area of the Faculty of Engineering, Sleman Regency, Yogyakarta. This building consists of 11 floors and 1 basement. The PGA (Peak Ground Acceleration) value based on the Indonesia earthquake map (2017) issued by the National Earthquake Study Center for a 2% probability of occurrence in 50 years. The calculation of the liquefaction potential analysis is done numerically with Settle 3D software. To analyze the bearing capacity and foundation settlement of the SGLC FT UGM building without the influence of liquefaction and after being affected by liquefaction using Geo5.

There are 2 drill points in the SGLC building area, namely point B1 and point B2 with sandy soil type and the groundwater level is at a depth of 6 meters. The results of numerical calculations using Settle 3D show that at point B1 liquefaction is at a depth of 8-14 meters and at point B2 at a depth of 8-22 meters. The vertical bearing capacity of the pile cap type F3, F4, and F5 around point B2 condition 1 and condition 2 is still able to withstand the axial force received, but not under condition 3. The maximum settlement that occurs in the pile cap type pile group F3, F4, and F5 point B2 conditions 1 and 2 still meet the requirements, but in condition 3 they do not meet the requirements. When liquefaction is working fully or the friction angle value is 0, it is proposed to improve with the analysis of condition 4, by increasing the length of the pile which was originally 20 meters to 21 meters on the F4 pile cap type and to 21.5 meters on the F3 & F5 pile cap type.

Key words : Liquefaction, Drill Pile Foundation, Foundation Bearing Capacity, Numerical Simulation, Sand Soil