



## INTISARI

Sirkuit Internasional Mandalika terletak pada Kabupaten Lombok Tengah, Nusa Tenggara Barat. Secara historis, Kabupaten Lombok Tengah memiliki peningkatan data seismik karena tiga kali bencana gempa bumi dengan magnitudo berkisar 6,8 sampai 7 selama tahun 2018. Gempa bumi pada tanah pasir jenuh bisa mengakibatkan likuefaksi, sehingga dilakukan perkuatan tanah eksisting guna mitigasi likuefaksi menggunakan *Controlled Modulus Columns* (CMC) pada STA 3+800 sampai STA 4+100. Peningkatan data seismik terdapat pada Peta Deagregasi Gempa 2022 sebagai pembaharuan terhadap Peta Gempa 2017. Oleh sebab itu, evaluasi potensi terhadap likuefaksi dan performa CMC terhadap desain seismik menurut Peta Deagregasi Gempa 2022 penting dilakukan dengan perbandingan perkuatan alternatif menggunakan metode *Stone Columns* yang sudah banyak diaplikasikan dalam upaya mitigasi likuefaksi di Indonesia.

Penelitian dilakukan berdasarkan 4 titik pengujian sondir (*CPT*) dan 1 data pengujian laboratorium. Evaluasi potensi terhadap likuefaksi didapatkan menggunakan metode *Simplified Procedure* dan *Liquefaction Severity Index* (*LSI*). Kriteria desain ditunjukkan dengan nilai *Safety Factor* (*SF*) terhadap likuefaksi minimal 1,1 dan tingkat keparahan likuefaksi sangat rendah. Evaluasi dan perancangan perkuatan tanah sebagai upaya mitigasi likuefaksi menggunakan metode homogenisasi tanah.

Kawasan STA 3+800 – STA 4+100 memiliki lapisan tanah dengan konsistensi campuran pasir sangat lepas sampai lepas hingga kedalaman 11 meter dan kedalaman muka air tanah pada 4 m di bawah permukaan tanah. Gradasi butiran tanah menunjukkan bahwa lapisan campuran pasir termasuk zona berpotensi likuefaksi. Hasil evaluasi likuefaksi dengan nilai *PGA* sebesar 6,475 m/s<sup>2</sup> dan magnitudo sebesar 7 menunjukkan lokasi berpotensi likuefaksi dengan nilai *SF* minimum 0,245 serta kategori tingkat keparahan likuefaksi sedang. Perkuatan tanah eksisting menggunakan CMC dibandingkan dengan *Stone Columns* menunjukkan peningkatan nilai *SF* sehingga tingkat keparahan likuefaksi menjadi sangat rendah. Tinjauan lapisan tanah menunjukkan *Stone Columns* memberikan kinerja keamanan terhadap likuefaksi lebih optimal dibandingkan dengan CMC. Analisis total biaya perkuatan tanah menunjukkan perkuatan *Stone Columns* lebih murah 17% dibandingkan menggunakan CMC.

Kata kunci : Sirkuit Internasional Mandalika, Peta Deagregasi Gempa 2022, Likuefaksi, *Controlled Modulus Columns* (CMC), *Stone Columns*.



## **ABSTRACT**

*Mandalika International Circuit is located in Central Lombok Regency, West Nusa Tenggara. Historically, Central Lombok Regency has increased seismic data due to three earthquakes with magnitudes ranging from 6.8 to 7 during 2018. Earthquakes on saturated sand soils can cause liquefaction, so existing soil reinforcement is carried out to mitigate liquefaction using Controlled Modulus Columns(CMC) at STA 3+800 to STA 4+100. Improved seismic data is contained in the 2022 Earthquake Deaggregation Map as an update to the 2017 Earthquake Map. Therefore, it is important to evaluate the potential for liquefaction and the performance of CMC against the seismic design according to the 2022 Earthquake Deaggregation Map with a comparison of alternative reinforcement using the Stone Columns method which has been widely applied in liquefaction mitigation efforts in Indonesia.*

*The research was conducted based on 4 sondir(CPT) test points and 1 laboratory test data. Evaluation of the potential for liquefaction was obtained using the Simplified Procedure and Liquefaction Severity Index(LSI) methods. Design criteria are indicated by a Safety Factor(SF) value against liquefaction of at least 1.1 and very low liquefaction severity. Evaluation and design of soil reinforcement as a liquefaction mitigation effort using the soil homogenization method.*

*The STA 3+800 - STA 4+100 area has a soil layer with a consistency of very loose to loose sand mixture to a depth of 11 meters and the depth of the groundwater table at 4 m below the ground surface. The gradation of soil grains shows that the sand mixture layer is included in the potential liquefaction zone. The results of the liquefaction evaluation with a PGA value of 6.475 m/s<sup>2</sup> and a magnitude of 7 indicate a potential liquefaction location with a minimum SF value of 0.245 and a moderate liquefaction severity category. Reinforcement of the existing soil using CMC compared to Stone Columns shows an increase in SF value so that the severity of liquefaction becomes very low. Review of soil layers shows Stone Columns provides more optimal safety performance against liquefaction compared to CMC. Analysis of the total cost of soil reinforcement shows Stone Columns reinforcement is 17% cheaper than using CMC.*

*Keywords: Mandalika International Circuit, 2022 Earthquake Deaggregation Map, Liquefaction, Controlled Modulus Columns(CMC), Stone Columns.*