INTISARI

Pada tahun 2006, gempa bumi dengan kekuatan 6,3 M_w terjadi di Kabupaten Bantul, DI Yogyakarta akibat aktivitas Sesar Opak dengan pola pergerakan *strike-slip*. Peristiwa tersebut memicu terjadinya likuefaksi dan memberi dampak kerusakan infrastruktur. Sebagai salah satu wilayah dengan aktivitas seismik yang tinggi, analisis risiko bahaya seismik dan likuefaksi menjadi penting dalam suatu perencanaan dan perancangan infrastruktur. Analisis bahaya seismik pada penelitian dilakukan melalui 4 metode: analisis data rekaman mikrotremor, analisis terhadap sumber gempa terdekat, analisis terhadap sejarah gempa berpengaruh, dan analisis probabilistik. Analisis potensi likuefaksi diperoleh melalui metode simplifikasi serta analisis nonlinear menggunakan DEEPSOIL v.7 dengan meninjau nilai *Safety Factor* (*SF*) terhadap likuefaksi dan peningkatan tekanan ari pori (r_u). Evaluasi potensi likuefaksi ditentukan melalui *Liquefaction Potential Index* (*LPI*) dan *Liquefaction Severity Index* (*LSI*). Dampak likuefaksi pada struktur dievaluasi melalui studi kasus terhadap fondasi kelompok tiang bor abutmen Jembatan Pandansimo dengan meninjau kapasitas dukung serta deformasi pada kelompok tiang bor secara empiris dan numerik menggunakan RSPile. Nilai *PGA* melalui peninjauan terhadap Sesar Opak sebagai sumber gempa terdekat menghasilkan rentang nilai 0,475 g – 0,549 g. Atenuasi terhadap sejarah gempa tahun 2006 menghasilkan rentang nilai 0,266 g – 0,394 g. Analisis mikrotremor menghasilkan rentang nilai 0,126 g – 0,214 g. Analisis probabilistik menghasilkan rentang nilai 0,373 g – 0,450 g. Lapisan berpotensi terlikuefaksi pada lokasi penelitian mencapai kedalaman 6 m – 20 m dengan rata-rata tingkat potensi likuefaksi tinggi dan tingkat keparahan likuefaksi rendah. Evaluasi dampak likuefaksi terhadap fondasi tiang bor menunjukkan penurunan daya dukung sebesar 3,56% pada abutmen A1 dan 40,93% pada abutmen A6. Terdapat peningkatan deformasi kelompok tiang bor pada lapisan tanah yang mengalami likuefaksi dengan perpindahan dalam batas izin deformasi yang ditentukan. Analisis bahaya gempa bumi dan likuefaksi pada lokasi dengan tingkat aktivitas seismik tinggi perlu dilakukan secara komprehensif dengan mempertimbangkan berbagai parameter, seperti kedekatan lokasi dengan sumber gempa, kondisi historis kegempaan, kondisi lokasi, serta proses perencanaan dan perancangan struktur secara keseluruhan.

Kata Kunci: Analisis bahaya seismik, Percepatan gempa bumi, *Liquefaction Potential Index*, *Liquefaction Severity Index*, Daya dukung fondasi tiang bor.

ABSTRACT

In 2006, an earthquake with a magnitude of 6.3 M_w occurred in Bantul Regency, Yogyakarta due to the activity of the Opak Fault with a strike-slip mechanism. The earthquake has led to liquefaction and cause significant damage to infrastructure. As one of the areas with high seismic activities, seismic hazard and liquefaction risk analysis is important in infrastructure planning and design. Seismic hazard analysis in the study was conducted through 4 methods: analysis of microtremor recording data, analysis of the closest earthquake source, analysis of the influential earthquake histories, and probabilistic analysis. Liquefaction potential analysis was obtained through the simplified method and nonlinear analysis using DEEPSOIL v.7 by evaluating the Safety Factor (SF) value against liquefaction and increased pore pressure (r_u). Liquefaction poten tial evaluation was determined through Liquefaction Potential Index (LPI) and Liquefaction Severity Index (LSI). The liquefaction effects on structures were evaluated through a case study of Pandansimo Bridge abutment bored pile group foundations by assessing the bearing capacity and deformation of the bored pile group empirically and numerically using RSPile. The PGA value through a consideration of the Opak Fault as the closest earthquake source resulted in a value range of 0.475 g - 0.549 g. The attenuation equation for the 2006 earthquake history resulted in a value range of 0.266 g - 0.394 g. Microtremor analysis resulted in a value range of 0.126 g - 0.214 g. Probabilistic analysis resulted in a value range of 0.373 g - 0.450 g. The potentially liquefiable layer at the site reaches a depth of 6 m - 20 m with an average level of high liquefaction potential index and low liquefaction severity index. Evaluation of the effects of liquefaction on bored pile foundations showed a reduction in bearing capacity of 3.56% at abutment A1 and 40.93% at abutment A6. An increase in the deformation of the bored pile group in the liquefaction-affected soil layer with displacement within the specified deformation allowable limit. The analysis of earthquake and liquefaction hazards in locations with high seismic activities need to be carried out comprehensively by considering various parameters, such as the location proximity to earthquake sources, historical seismic conditions, site conditions, and the overall structural planning and design process.

Keywords: Seismic hazard analysis, Ground acceleration, Liquefaction Potential Index, Liquefaction Severity Index, Bearing capacity of bored pile foundation.