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Dynamic Characterisation and Ground Response Analysis of Clay Soil Profiles

Rangaswamy K

Department of Civil Engineering, National Institute of Technology Calicut, Kerala, India

Abstract

The analysis of foundation vibrations and geotechnical earthquake engineering problems in Civil engineering requires the characterization of dynamic soil properties. Hence the dynamic soil properties play a significant role in the determination of the stiffness of the soil against various dynamic loadings. The soil properties associated with dynamic loading are shear modulus (G), damping ratio (D) and Poisson's ratio (μ). Many problems related to dynamic loadings, such as earthquakes and vibrations from traffic, are dominated by wave propagation effects where only low-level strains are induced in the soil. In the past, only a few studies have discussed the low strain dynamic properties of clay soil. In this paper, Bender element testing has been conducted to induce the shear wave velocity in the clay soil by varying the test parameters. The parameters varied in the test program are the degree of consolidation, effective confining pressures, density, cohesion and plasticity of clay soil. The study proved that the tested parameters of clay soil significantly affect shear wave velocity and the maximum shear modulus of clay soil. With the obtained dynamic parameters of shear wave velocity and modulus, ground response analysis has been performed using the Proshake GRA programme to assess the amplification of motion towards the soil foundation level.

Keywords: Clay, Bender element, Dynamic shear modulus, GRA