

論文要旨

Summary of Dissertation

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論文題目 Title	Constitutive Model Considering Density Effect for Crushable Soils and Its Application for Geotechnical Problems
和訳	密度の影響を考慮した破砕性土の構成モデルとその地盤工学的問題への応用
<p>Ground exhibiting particle crushing can strongly affect foundation structures especially pile foundations with large magnitude of stresses at the pile's tip. In order to obtain a rational estimation of deformation and failure, numerical simulation with an appropriate constitutive model of crushable soils is necessary. Thus, the aims of this study are: 1) to establish a rational constitutive model of crushable soils which incorporates the effect of packing density; 2) to conduct numerical simulations with implementation of the proposed model for pile foundation problems.</p> <p>The first part of this study deals with the constitutive model of the crushable soils based on a novel evolution law for grading index, which incorporates the effect of packing density on the particle crushing phenomena through the coordination number as intermediate variable. The validity of the proposed constitutive model was verified by comparing the simulation results with an extensive series of elementary tests. The advantage of the proposed model is its capability in predicting seemingly contradictory experimental evidence for crushable soils: densely packed soil exhibits lesser crushing than loosely packed soil under the same effective stress path; densely packed soil is more likely to crush than loosely packed one when it is sheared under drained or undrained conditions.</p> <p>The second part of this study deals with numerical simulations for single pile foundation on crushable soils. The simulations using FEM (by PLAXIS) incorporates User-Defined-Material (USDm) by the proposed model. Preliminary simulation results show consistency with former experimental studies relating to the breakage zone around pile's tip and pile shaft. The failure mode of single pile on the Dog Bays sand is punching shear mode. The densely packed soil exhibits more breakage and higher load in the load-settlement curves as compared to the loosely packed soil.</p>	