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Abstract

COMPARATIVE STUDY OF SOIL CONSTITUTIVE
MODELS ON SIMULATION OF A DIAPHRAGM WALLED
EXCAVATION IN MACAO ALLUVIUM

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In this thesis, the application of several famous soil constitutive models to study the behavior of Macao alluvium in diaphragm walled excavation was carried out. They are Isotropic Linear Elastic model (ILE), Mohr-Coulomb model (MC), Duncan Hyperbolic model (EB), Lade model (LD), Modified Cam clay model (MCC) and Three Surface Kinematics Hardening model (3SKH). The results of the analyses were compared with observations. The wall deflection, ground settlement, displacement contour, effective shear strain contour, stress paths, bending moment and strut load were studied.

Two sets of stiffness parameters evaluated from field measurement for Macao alluvium were examined (1) Equivalent Elastic Young's Modulus Approach; (2) Shear Wave Velocity Approach.

For small strain around excavation, reasonable results can be obtained only if an appropriate soil stiffness is assessed. For calculation of wall deflection, mean soil stiffness is appropriated for ILE, MC, MCC and 3SKH, while high soil stiffness at small strain with adopted degradation parameter is suitable for EB and LD in modeling the wall deflection at early excavation stage. In calculation of ground settlement, soil model which is capable of modeling volume-change behavior would be appropriated. The performance of EB and LD are basically satisfactory.