3. Non-Linear Numerical Analyses of Shear Failure of Grounds

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The purpose of this study is proposal of the non-linear numerical analysis method of shear failure of grounds. In this paper, we investigated foregoing pipe-roof protection works for excavation of grounds and bearing capacity of surrounding soils by the model experiments and numerical analyses.

In this experiment, the plane strain conditions are satisfied and the sand layer is made using Toyoura sand that water content is about 5%.

In this numerical analysis, the linear isoparametric element is used with 1-point integration. The non-linear analysis is performed by the implicit-explicit dynamic relaxation method combined with the generalized return-mapping algorithm. The yield function is the Mohr-Coulomb type function and the plastic potential is the Drucker-Prager type function, and the shear band, the strain hardening, the strain softening, and anisotropy are taken into account. And the finite deformation analysis is applied to this numerical method.

The observed roof deformation and position of shear band in the sand layer are simulated well by this numerical method. We may say that this finite deformation analysis is useful to investigate shear failure of grounds by excavation.

Key words : a strain hardening and softening elasto-plastic model, finite deformation analysis, the implicit-explicit dynamic relaxation method