

Xie, Kanghe; Qi, Tian; Dong, Yaqin

Nonlinear analytical solution for one-dimensional consolidation of soft soil under cyclic loading. (English) [Zbl 1105.74021](#)

J. Zhejiang Univ., Sci. A 7, No. 8, 1358-1364 (2006).

Summary: This paper presents an analytical solution for one-dimensional consolidation of soft soil under some common types of cyclic loading such as trapezoidal cyclic loading, based on the assumptions proposed by *E. H. Davis* and *G. P. Raymond* [*Geotechnique* 15, No. 2, 161–173 (1965)] that the decrease in permeability is proportional to the decrease in compressibility during the consolidation process of the soil, and that the distribution of initial effective stress is constant with depth. Our solution is verified by analytical solutions existing in special cases. Using the solution obtained, some diagrams are prepared and the consolidation behavior is investigated.

MSC:

[74L10](#) Soil and rock mechanics

[74F10](#) Fluid-solid interactions (including aero- and hydro-elasticity, porosity, etc.)

[76S05](#) Flows in porous media; filtration; seepage

[86A05](#) Hydrology, hydrography, oceanography

Keywords:

[trapezoidal loading](#); [permeability](#); [compressibility](#)

Full Text: [DOI](#)

References:

- [1] Baligh, M. M.; Levadoux, J. N., Consolidation theory of cyclic loading, *Journal Geotechnical Engineering Division ASCE*, 104, 415-431, (1978)
- [2] Chen, J.Z., Zhu, X.R., Xie, K.H., Pan, Q.Y., Zeng, G.X., 1996. One-dimensional Consolidation of Soft Clay under Trapezoidal Cyclic Loading. *Proceedings of the Second International Conference on Soft Soil Engineering*. Nanjing, China, p. 161-173.
- [3] Davis, E. H.; Raymond, G. P., A non-linear theory of consolidation, *Geotechnique*, 15, 161-173, (1965) · [doi:10.1680/geot.1965.15.2.161](#)
- [4] Favaretti, M., Soranzo, M., 1995. A Simplified Consolidation Theory in Cyclic Loading Conditions. *Proceedings of International Symposium on Compression and Consolidation of Clayed Soils*. Japan.
- [5] Gao, Y.F., Xie, K.H., Zeng, G.X., Wang, Z.H., 1999. Study on the Influences of s-wave Velocity Uncertainty on the Seismic Parameters of Clay Ground. *Pro. 11th ARCSMFE*, p.559-562.
- [6] Poskitt, T. J., The consolidation of saturated Clay with variable permeability and compressibility, *Geotechnique*, 19, 234-252, (1969) · [doi:10.1680/geot.1969.19.2.234](#)
- [7] Schiffman, R. L., Consolidation of soil under time-dependent loading and varying permeability, *Proceedings Highway Research Board*, 37, 584-617, (1958)
- [8] Wilson, N. E.; Elgohary, M. M., Consolidation of soils under cyclic loading, *Canadian Geotechnical Journal*, 11, 420-423, (1974) · [doi:10.1139/t74-042](#)
- [9] Xie, K. H.; Pan, Q. Y., One dimensional consolidation theory of arbitrary layers under time-dependent loading, *Chinese Journal of Geotechnical Engineering*, 17, 80-85, (1995)
- [10] Xie, K.H., Leo, C.J., 1999. An Investigation into the Nonlinear Consolidation of Layered Soft Soils. *Research Report CE11*, School of Civil Engineering and Environment, UWS, Nepean, Australia.
- [11] Xie, K.H., Li, B.H., Li, Q.L., 1996a. A Nonlinear Theory of Consolidation under Time-dependent Loading. *Proceedings of 2nd International Conference on Soft Soil Engineering*, Nanjing, China, p. 193-198.
- [12] Xie, K.H., Guo, S., Zeng, G.X., 1996b. On the Consolidation of the Soft Clay Ground Beneath Large Steel Tank. *Proceedings of Conference on Advances in Steel Structures*. Hong Kong, p. 1194-1204.
- [13] Xie, K. H.; Xie, X. Y.; Jiang, W., A study on one-dimensional nonlinear consolidation of double-layered soil, *Computers and Geotechnics*, 29, 151-168, (2002) · [doi:10.1016/S0266-352X\(01\)00017-9](#)
- [14] Zhuang, Y. C.; Xie, K. H., Study on one-dimensional consolidation of soil under cyclic loading and with varied compressibility, *Journal of Zhejiang University SCIENCE*, 6A, 141-147, (2005) · [doi:10.1631/jzus.2005.A0141](#)
- [15] Zhuang, Y. C.; Xie, K. H.; Li, X. B., Nonlinear analysis of consolidation with variable compressibility and permeability, *Journal of Zhejiang University SCIENCE*, 6A, 181-187, (2005) · [doi:10.1631/jzus.2005.A0181](#)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.