

Evaluation of Spatial Correlation Length and Karhunen-Loeve Expansion Terms for Predicting Reliability Level of Long-Term Settlement in Soft Soils

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Abstract : The spectral random field method is one of the widely used methods to obtain more reliable and accurate results in geotechnical problems involving material variability. Karhunen-Loeve (K-L) expansion method was applied to perform random field discretization of cross-correlated creep parameters. Karhunen-Loeve expansion method is based on eigenfunctions and eigenvalues of covariance function adopting Kernel integral solution. In this paper, the accuracy of Karhunen-Loeve expansion was investigated to predict long-term settlement of soft soils adopting elastic visco-plastic creep model. For this purpose, a parametric study was carried to evaluate the effect of K-L expansion terms and spatial correlation length on the reliability of results. The results indicate that small values of spatial correlation length require more K-L expansion terms. Moreover, by increasing spatial correlation length, the coefficient of variation (COV) of creep settlement increases, confirming more conservative and safer prediction.

Keywords : Karhunen-Loeve expansion, long-term settlement, reliability analysis, spatial correlation length

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