# VERTICAL IMPEDANCE FUNCTION OF RIGID STRIP FOOTING OVER HETEROGENEOUS HALF-SPACE WITH INCREASING STRENGTH WITH DEPTH

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Calculation of impedance functions is an important step in an analysis that takes into account soil-structure interaction. By introducing the impedance functions of a footing, the supporting soil can be replaced by a set of springs and dashpots and the structure on it can be analysed easily.

Different analytical and numerical methods can be utilized to evaluate the impedance functions. Analytical methods are capable of computing impedance functions of simple geometry such as shallow strip footing over semi-infinite homogenous isotropic soil medium. Impedance functions are also obtained for single layer beneath the footing over half space by Tzong, and Penzien (1983). These results can be used for verification of some preliminary calculation.

In this study, the vertical impedance function and the vertical compliance function of rigid strip footing over a homogeneous and heterogeneous half-space is calculated and then real and imaginary values of them are extracted. The investigation is carried out for different soil profiles and the results are presented as real and imaginary values of the vertical impedance function and the vertical compliance function and the effect of soil heterogeneity on dynamic response of footing has been discussed. The finite difference program FLAC 2D is used for modelling and analysing the problem and viscous boundaries are used to avoid unreal reflection of wave from model boundaries.

To validate the strategy utilized in FLAC 2D, nonhomogeneous model as a two-layered system which consists of soil layers with different shear modulus is considered. Figure 1 are the computed real and imaginary parts of vertical compliance function. As shown in Figure 1, the obtained results are compared to the results in the literature and there are good agreement between these results. In other heterogeneous soil model, the soil media is assumed as a half-space in which the shear modulus varies with depth according to a nonlinear bounded homogeneity function (Figures 2 and 3). As shown in these diagrams, by decreasing the state parameter α, the real and imaginary parts of compliance functions converge to the results of homogenous media.

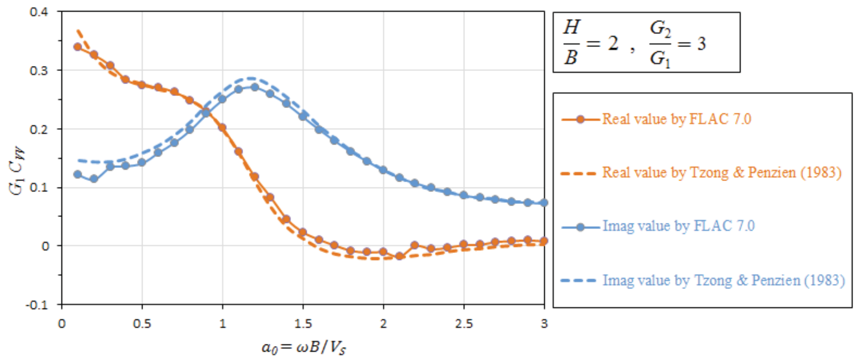


*Figure 1. Real and imaginary parts of vertical compliance function and the results in the literature.*

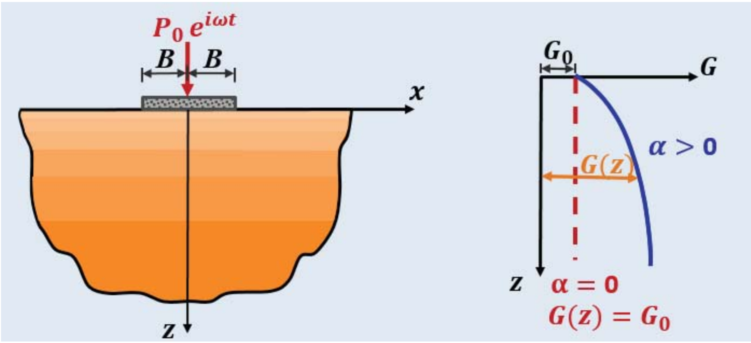


*Figure 2. Heterogeneous system with nonlinear variation of shear modulus with depth.*

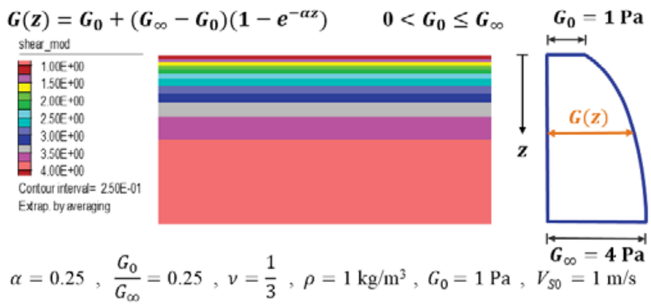


*Figure 3. FLAC 2D model of heterogeneous system.*

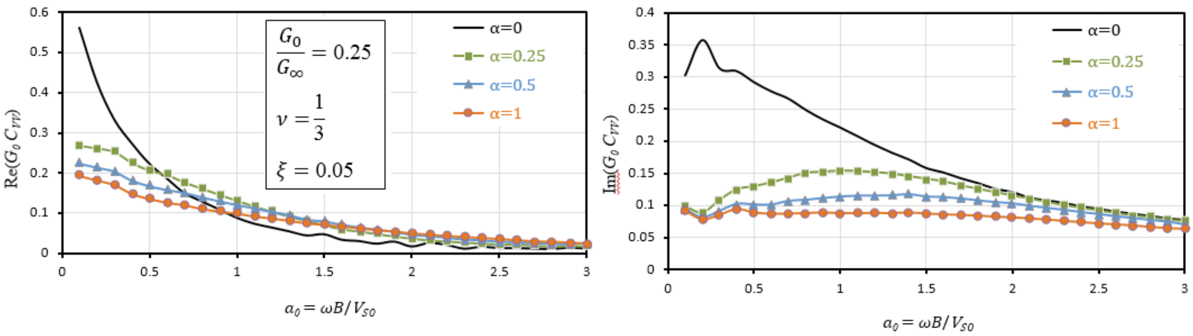


*Figure 4. Real (left) and imaginary (right) parts of vertical compliance function and the results in the literature.*

## REFERENCES

Tzong, T., and Penzien, J. (1983). Hybrid Modelling of Soil-Structure Interaction in Layered Media, *EERC*, 83-22.