DYNAMIC BEHAVIOUR OF EMBEDDED STRUCTURES

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Structures have varying depth of embedment depending upon its type and foundation. The effect of embedment is particularly important for containment structures of nuclear power plants, bridges over waterways having well (caisson) foundations and machine foundations. The effect of soil-structure interaction on such systems are usually determined either by using the continuum approach or by finite element techniques. In this study, the continuum approach has been used to represent the soil at the side as well as at the base by equivalent springs and dashpots. Frequency independent parameters have been used in the analysis. In the mathematical model, the modulus of subgrade reaction has been used to obtain the side springs constants and base soil stiffness has been derived from elastic half space theory. The structure has been assumed to be cylindrical in shape. A parametric study has been carried out in which the shear wave velocity (v_s) of the base, modulus of subgrade reaction (n_h) of the side soil, depth of embedment, and the size of the structure have been varied over a practical range.

Results obtained for one typical set of parameters are briefly discussed here. The cylindrical structure had the following properties : Diameter = 50 m, Height = 50 m, Thickness of top slab =2.5 m, Thickness of bottom slab = 2.5 m, Thickness of shell = 0.6 m. For half embedment, with a constant value of n_h = 1000 t/m^3, as the shear wave velocity increases from 200 m/s to 1200 m/s, the fundamental time period reduces from 0.655 s to 0.290 s. Whereas, as n_h of side soil increases from 750 t/m^3 to 2000 t/m^3 the fundamental time period reduces from 0.650 s to 0.622 s for a constant v_s of 200 m/s

The influence of depth of embedment is as follows:For quarter, half, three quarter and full depth of embedment for v_s = 200 m/s and n_h = 1000 t/m^3, the fundamental time periods are 0.638 s, 0.644 s, 0.572 s and 0.464 s respectively.

It can be concluded that the response of the structure is very much influenced by the type of soil and depth of embedment whereas the type of side soil has relatively less influence on the response.

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