00581-SE

7th International Conference on Seismology & Earthquake Engineering
18-21- May 2015

THE EFFECT OF FOUNDATION ADJACANCY ON SEISMIC INPUT MOTIONS: THE CASE OF TWO STRIP EMBEDED FOUNDATIONS

Ali ESMAEILPOUR
Graduate Student, Dept. of Geotechnical Engineering, IIEES, Tehran, Iran
a.esmaeilpour@iiees.ac.ir

Hossein JAHANKHAH
Assistant Professor, Dept. of Geotechnical Engineering, IIEES, Tehran, Iran
h.jahankhah@iiees.ac.ir

Keywords: Kinematic Interaction, Adjacent Strip Foundations, Input Motion

Many important buildings are located in urban area where they are surrounded by numerous smaller and larger size structures with different distances. The literature on SSI phenomenon, however, mostly consists of just the target building or foundation on a half-space (Luco and Westmann, 1971 and Thang and Vincent, 2014) or rather two rectangle cross section foundations (Pais, 1985). Also few studies can be found on adjacent buildings with semi-cylinder cross section under plane SH wave.

In this work the proximity effect of two strip foundations on foundation input motion is investigated. Various embedment depths and different proximity distances between foundations are studied. The simulation of model is done by ABAQUS software.

The model details and its parameters are illustrated in Figure 1. The half-space medium is modelled by 16B (fixed dimension) in width and 8B in height. Two soil columns are considered on either side of the model to simulate free field motion on side boundaries. Vertical and tangential viscous dampers are used to connect free field columns and the main middle-part of the model. The bottom boundary is assumed to be viscoelastic which fulfils both absorbing and stability requirements of the model.

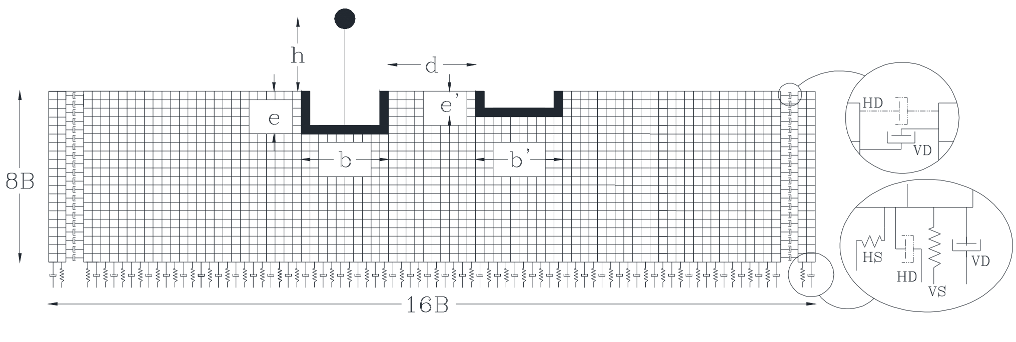

Figure 1. Schematic modeled soils and adjacent foundations in ABAQUS

In Figure 1, parameters B, d, b, b', e, e' and h are benchmark dimension, distance between foundations, width of main and adjacent foundation, depth of main and adjacent foundation and height of one degree of freedom structure on main foundation respectively. Also VD and HD are used for define vertical and horizontal dashpots.

Variability of non-dimensional parameters is shown in Table 2. The main foundation width (b) is fixed as 2B. The parameters are then non-dimensionalized to provide the base for general conclusion and the structure is assumed to be massless.

Table 1. Ratio of parameters used in simulation

Parameters	b/B	b'/B	e/B	e'/B	d/B	h/B
ratio	2	1,2	0,0.5,1	0,1,2	1,2	0,1,2,3,4

In Figure 2 the normalized amplitude $|U_x/U_0|$ and $|B*U_r/U_0|$ are investigated as different components of FIM. U_x, U_r and U_0 are horizontal and rocking amplitude of the rigid foundation response at bottom of structure and horizontal amplitude of free field motion on the soil surface. The results are depicted versus dimensionless frequency (a_0). This parameter is defined as follow:

$$a_0 = \omega * B / V_s \tag{1}$$

Where ω and V_s are excitation circular frequency and shear wave velocity of soil respectively.

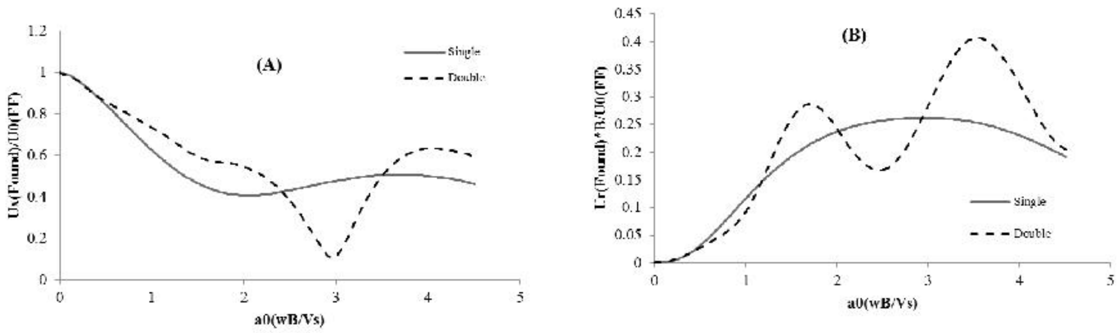

Figure 2. Normalized amplitude of the horizontal (A) and rocking (B) components of the foundation input motion of main foundation. b'/B=1, e/B=1, e'/B=1, d/B=2

The results shown in Figure 2 reveal that the adjacency would affect the FIM severely both is horizontal and rocking components.

REFERENCES

Abaqus 6.11. (2011) Standard user's manual, Rhode Island: Hibbit, Karl*sson* and Sorensen *Inc.*

Luco JE and Westmann RA (1971) Dynamic Response of Circular Footing, Journal of Engineering Mechanic Division, ASCE, 97: 1381-1395

Pais A L (1985) Dynamic Coupling of Multiple Structures Through Soil, Ph.D. Thesis, Massachusetts Institute of Technology, Massachusetts, USA

Thang HL and Vincent WL (2014) Out-of-Plane (SH) Soil-Structure Interaction: Semi-Circular Rigid F*oundation Revisited*, *Soil Dynamics and Earthquake* Engineering, 66 (2014), 149-156

Wong HL and Trifunac MD (1975) Two-Dimensional, Antiplane, Building-Soil-Building Interaction for Two or More Buildings and for Incident Plane SH waves, Bulletin of the Seismological Society of America, 65(6): 1863-1885