KINEMATIC INTERACTION OF STRIP EMBEDDED FOUNDATION WITH INCOMPLETE CONTACT BETWEEN SIDEWALL AND SURROUNDING SOIL

Pouran FALLAHZADEH
PhD Student, IIEES, Tehran, Iran
p.fallahzadeh@iiees.ac.ir

Hossein JAHANKHAH
Assistant Prof., IIEES, Tehran, Iran
h.jahankhah@iiees.ac.ir

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Kinematic interaction (KI), is one of the prominent topics in the field of Soil-Structure interaction that would alter the seismic input motion. This alternation usually modifies the frequency content and even may become a source of generation a set of input motions in new degrees of freedom (Bielak, 1974; Iguchi, 1982). A well-known example of the above phenomena is the reduction in horizontal amplitude and inducing rocking input motion to embedded foundation under vertical propagating shear waves (Mori and Fukuwa, 2012; Pais and Kausel, 1985). According to previous findings, KI would be affected by different parameters like properties of soil, shape of foundation, and depth of embedment.

However, most researches in this field are formed based on the assumption of full contact between foundation and surrounding medium. That is while the more realistic case of partial contact with neighbouring medium has rarely been investigated yet (Ahmad and Bharadwaj, 1991). The other notable point is that the influence of KI on the response spectrum has not attracted enough attentions in spite of its engineering prominence.

In this paper, first the effect of KI on input motion for the case of single strip embedded foundation with incomplete contact between sidewall and nearby soil, under vertical propagation of shear waves is investigated. Then it is discussed that how this input-change would be reflected in response spectrum. The model detail and its parameters are illustrated in Figure1. In which *D* is embedded depth, *d* is contact length and *a* is half wide of foundation.

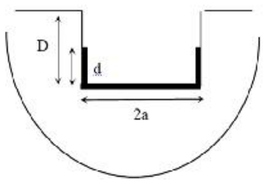

Figure 1. Strip foundation with partial contact of sidewall with the soil

Numerical analysis conducted by ABAQUS, finite element software, for extracting the transfer function component of Kinematically induced input motions. This simulation is two dimensional and would be done for strip foundation. Table 1 represents the soil properties and foundation dimensions of this model. Figure 2 depicts the deformed shape and input pulse inserted at the base of model.

Table 1. Properties of soil and foundation dimensions

Prop.	υ	ρ	Vs	a	D	d
	0.3	1.65gr/cm^3	100m/s	3m	3m	1.5m

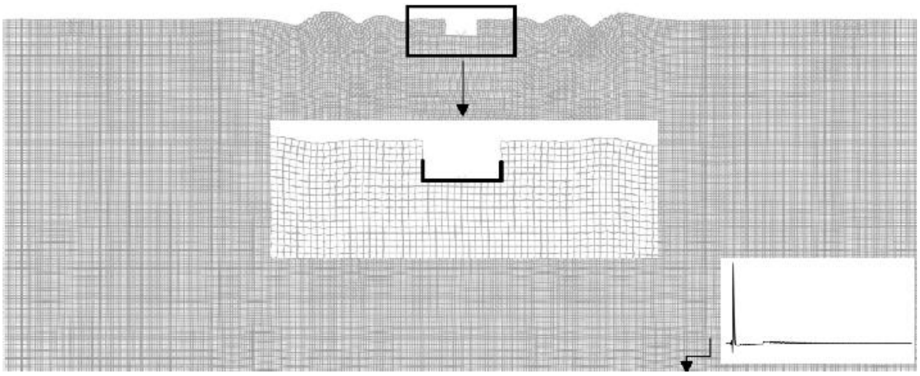

Figure 2. Deformed shape of the model

Figure 3 shows the transfer function of foundation with *d/D=0.5*. In this graphs, TF is plotted against $a_0=\omega*a/V_s$, dimensionless frequency, where ω is frequency of excitation. U and UR are horizontal and rotational components of foundation input motion respectively and Uff is free field motion. As can be seen, embedment with partial contact of sidewalls can highly affect frequency content of input motions.

The effect of KI on the response spectrum is then investigated. The results reveal significant fluctuations in spectrum ordinates in low periods.

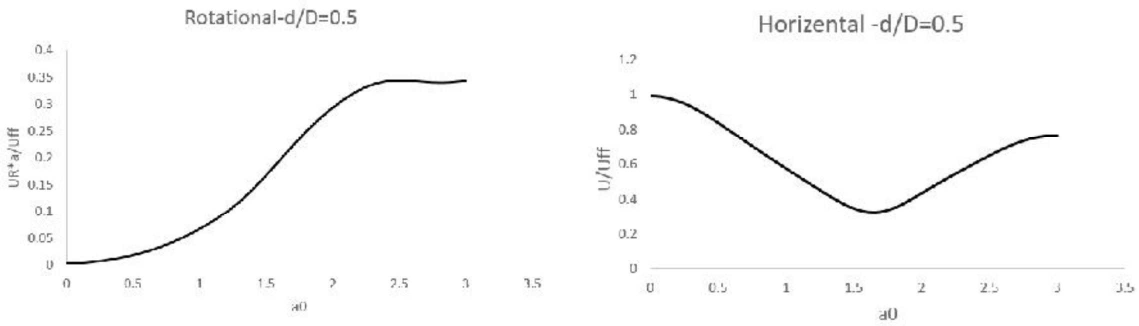

Figure 3. Horizontal and Rotational components of transfer function

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