CHAPTER VI

CONCLUSIONS

Analyses of soil-structure interaction problems by means of two-dimensional plan strain models were studied. Excitations caused by point loads and seismic loads were examined to test the validity of the models. The main findings that can be concluded are the following :

1. An extension of the simplified three-dimensional model developed by Hwang, Lysmer and Berger to reproduce three-dimensional effects can be simply achieved by attaching side springs and dashpots to both sides of the plane strain model. In contrast to the simplified three-dimensional model, the proposed model yields good results for the problems of point loads on footings resting on half space.

2. The proposed equivalent plane strain model cannot be applied to foundations in which the soil medium rests on the bed rock at a finite depth. In such cases the addition of the side spring stiffness and the reduction of soil mass would produce an unrealistic model resulting in significant discrepancy in the fundamental frequency.

3. In case of pile foundations with applied concentrated loads, the proposed model is too much simplified to capture the complicated three-dimensional behaviour of such problems.

4. The seismic loadings, especially in urban areas where buildings are closely located together in reality, the ordinary plane strain model without any modification would be appropriate since the medium displacements between each

slice of a unit width are not much different.

5. The proposed soil-pile element incorporating the host plane strain soil medium is very easy to use, especially in data preparation. The only one weakness of the soil-pile element is that the host soil element cannot be much wider than the width of the embedded piles otherwise the element would be too stiff. Since the element derivation is simple, the same approach can be extended to the real three-dimensional case without any difficulty.

6. Based on the limited studies on the pile effects, it is found that there is practically no difference between the transfer functions of the half space without pile and that of the half space with single-line piles which are spaced at three times pile diameter. For the case of two-line piles, the transfer function at fundamental frequency is reduced by about 20%. Pile effect is more significant in this study than that predicted assuming axisymmetric condition, in which no piles exist outside the region considered, a condition not usually realized in reality in an urban area. Thus it can be roughly concluded that in an urban area where many piles prevail in rows, the magnitudes of the transfer function of such cases can be considerably lower than that of the free field.