DYNAMIC RESPONSE ANALYSIS OF SUBMERGED SOIL BY THIN LAYERED ELEMENT METHOD

by

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ABSRACT: A thin layered element method is formulated to compute the dynamic response of submerged soil. The formulation is based on Biot's equation describing the dynamic behavior of fluid-saturated elasto-porous medium. The dynamic response of submerged soil is computed for various cases by using the developed formulation. The effects of submerged conditions are examined for submerged soil deposits with a water level at and above the ground surface. It is found that both submerged conditions and water above the ground surface can considerably affect the dynamic response of soil deposits.

INTRODUCTION

When the dynamic load is applied to saturated soil, pore fluid movement relative to soil skeleton may be induced. The transient movement and redistribution of pore fluid can significantly affect the dynamic response soil behavior. Those are generally governed by the loading rate, soil permeability, pressure gradient and boundary conditions, resulting in an extremely complex picture of the dynamic response behavior of submerged soil.

Biot (1962) has made a framework in the formulation of dynamic response of fluid-filled elasto-porous medium . This formulation has been generally used for dynamic response analysis of submerged soil and evaluated typically by either analytical solutions obtained by solving the differential equations or the numerical finite element method. Considerable difficulty exists in obtaining analytical solutions for Biot's equation in general and thus the solutions have been developed only for very simple conditions (e.g. Biot, 1956; Jones, 1961; Deresiewics, 1960; Foda and Mei, 1982). Those conditions are generally far from those commonly encountered in the real situation. The finite element

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