OHN10110501354
Trench Barriers to Protection of Structures under Dynamic Loadings-2

Hassan Negahdar[1]

1-Postgraduate student, Department of Soil Mechanics, Basement and Foundations, National Research University Moscow State University of Civil Engineering (MGSU)

hassan_negahdar@yahoo.com

Abstract

Wave barriers are intended to mitigate the transmission of vibrations in the soil. In this study, two-dimensional finite difference element analysis has been carried out, to investigate the efficiency of open and in-filled barriers under dynamic loading without or with presence of the structure. In this contribution, on the basis of the general basis for yield, failure and potential functions in plasticity in soil, two constitutive models to studying the rate of soil response in the elastic and elastoplastic range have been investigated. From numerical analysis be concluded that the results achieved with assigning elastic properties to the soil material doesn't follow the trend with the result that have been achieved from analysis of the model with non-linear properties of soils, with higher values at all points. Presence of structure has a significantly larger effect on efficiency of barriers on reducing surface wave energy with assigning nonlinear modulus to soil.

Keywords: Wave Barrier, Soil Displacement, Strain-Hardening and Elastic Model.

1. Introduction

Wave barriers are used to reduce ground-borne vibrations induced by different sources such as machine foundations, earthquake, dynamic compaction, high speed trains and etc. Most of these vibrations propagate in the soil in the form of surface waves and can travel for long distances. The geometry, location and composition of the wave barrier influence the isolation performance. Regarding the literature on ground-borne vibrations, Barkan (1962), as the first scientist, used screening against vibration waves with open trenches and reported that open trench dimensions are large enough relative to the wavelength of the surface motions [1]. In three past decades an extensive research have been carried out by Russian scientists like Musyaev V.K. and others to investigation barriers efficiency in screening of surface waves in soil[3-5].

The finite difference method is perhaps the oldest numerical technique used for the solution of sets of differential equations, given initial values and/or boundary. In this study the 2D finite difference element model was developed by utilizing the FLAC package. In the analysis of geotechnical problems, the choice of an appropriate constitutive model may have a significant influence on the numerical results. Every constitutive model has its advantages and limitations.

2. State of research

To studying the efficiency of open and in-filled barriers under dynamic loading with or without structure, the developed models analyzed, with assuming two behavior models for soil; strain hardening(nonlinear) and elastic(linear). Based on standard some available tests, general parameters have been developed for determination of nonlinear constitutive material parameters. In all analysis the properties of concrete and structure have been assumed linear and in elastic mode, so only soil materials have been assumed non-linear or in linear one. The soil was modeled in a half-space. The dynamic properties of soil and other materials that have been used in analysis were found to be as following (Table.1).

In this study, the structure (10 meters in width and 15m in height) was approximated to an equivalent rectangular shape. The structure was located on the right side of barrier at ground surface. Mat foundation of structure located at the 1.0m depth under the ground surface. In this paper be assumed that the vertical