Journal of Acoustical Engineering Society of Iran, Vol. 8, No. 2, 2021

(Research Article)
Study of the acoustic wave behavior sent to a buried tunnel

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Abstract

In the present study, by sending acoustic waves to an underground tunnel, as a free air explosion, and measuring the pressure level of the reflected waves to the surface and the transmitting waves to the interior space of the structure, the effects of the parameters, such as tunnel existence, soil nonlinear behavior, energy dissipated boundary conditions, soil density and modulus of elasticity are analyzed. Based on the results, it is observed that in the presence of the tunnel and by assigning the wave dissipated boundary conditions to the far ends of the model, the pressure level of the acoustic wave is reduced. Furthermore, it is resulted that the effect of the soil nonlinearity is negligible. It is illustrated that for the softer soils, although the energy dissipation is increased, because of the growth in vibrations due to the lack of soil solidity, the transmitted waves are amplified. Moreover, it is shown that the pressure level for the stiffer soils is more sensitive to the soil density variation than the softer ones. By comparing the present results with results extracted from the similar papers, it is concluded that the way the explosion modeled, the geometric properties of the tunnel section and the most important of all, the buried depth of the tunnel have significant effects on the behavior and trend of the reflected and transmitted acoustic waves for different models of soil around the tunnel.

Keywords: Acoustic wave pressure, Reflected and transmitted wave, Free air explosion, Underground structures.

pp. 104-117 (In Persian)

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[DOR: 20.1001.1.23455748.1399.8.2.4.1]