On The Construction With Base Under Dynamic Loads

Juraev T.O.,

Bukhara Engineering - Technological Institute

Republic of Uzbekistan, town Bukhara, str. K. Murtazaev 15, index 200100

jurayev1964@mail.ru

Kurbonov A.M.

Bukhara Engineering - Technological Institute

Republic of Uzbekistan, town Bukhara, str. K. Murtazaev 15, index 200100

***Abstract*—In this paper we propose a solution of vertical and torsional vibrations of a viscoelastic half-space when to apply the ideas of complex elastic module. The equations of motion of a mechanical system is obtained based on the principle of d'Alembert.**

Keywords—Torsional vibrations of the elastic modules, mechanical system, viscoelastic half-wave propagation.

Introduction.

Fluctuation in the base is one of the main problems that have comprehensive technical applications, such as: foundations under the walls, various types of construction of pavements and airfields etc. Vertical and torsional oscillations of an elastic half-space, it was decided in [1,2]. In this paper we propose solutions vertical and torsional vibrations of a viscoelastic half-space when to apply the ideas of complex elastic module [4]. Estimated work deals with the problem of dynamic collaborative design with a base under seismic actions. Seismic waves propagate from the level mountain range through the layered medium in the direction of the design [5,6,7,8].

Statement of the problem.

The propagation of shear waves through the layered medium [3]. Focuses on the extreme case of vertically propagating transverse action of seismic waves, their reflections and transitions through a layered soil medium. The equation of motion of the wave propagation named as follows:

$$\frac{\partial^2 \vartheta}{\partial t^2} - c^2 \frac{\partial^2 \vartheta}{\partial z^2} = 0, \quad c = \sqrt{\frac{G}{\rho}} \qquad (1)$$

where G - shear modulus; -ρ density of the material. Solution of the differential equation (1) [1], we can write the following

$$\vartheta(z,t) = f_1\left(t - \frac{z}{c}\right) + f_2\left(t + \frac{z}{c}\right). \qquad (2)$$

At the boundary z = 0: $\vartheta(o,t) = f_1(t) + f_2(t)$, $f_1(t) = f_2(t)$ then.

$$\vartheta(o,t) = 2 f_1(t).$$

$$\alpha_{ik} = \frac{2}{1 + \frac{\rho_k c_k}{\rho_i c_i}}; \quad \alpha_{ki} = \frac{2}{1 + \frac{\rho_i c_i}{\rho_k c_k}};$$

$$\beta_{ik} = \frac{\frac{\rho_i c_i}{\rho_k c_k} - 1}{\frac{\rho_i c_i}{\rho_k c_k} + 1}; \quad \beta_{ki} = \frac{\frac{\rho_k c_k}{\rho_i c_i} - 1}{\frac{\rho_k c_k}{\rho_i c_i} + 1}$$

Developed solutions to the n - layer system in the liver study changes over time coming and going waves from layers of granules on the rock and on the surface of the soil. For one-layer and two-layer system solution adapted to the computational point of view, less difficult version, in which we study the time variation of the oscillation at the rock mass, and on the surface of the soil. Building structure - rigid foundation under the current horizontal seismic movement developed two versions. In the first oscillation rigid foundation is solved classic methods, i.e. separately under loading seismic acceleration on the surface of the soil by the ratio

$$\ddot{x}(t) = \alpha_{01} \sum_{j=1}^{j_{\max}} 2\beta_{01}^{j-1} e^{-\varepsilon H_1 (2j-1)} \ddot{x}_0 \left(t - \frac{H_1(2j-1)}{C_1} \right).$$

The second version is that the load of seismic acceleration and actions are taken into account of $\ddot{x}(t)$,secondary reflected unrest in soil medium, due to variations in the structure. Solution of fluctuations foundation by using equations

$$\begin{aligned} &m\ddot{u}(t) + k_{11}\dot{u}(t) + k_{12}\dot{\varphi}(t) + C_{11}u(t) + C_{12}\varphi(t) = -m\ddot{\alpha}(t) \\ &I\ddot{u}(t) + k_{21}\dot{u}(t) + k_{22}\dot{\varphi}(t) + C_{21}u(t) + C_{22}\varphi(t) = 0 \end{aligned} \qquad (3)$$

where $k_{11}, k_{12}, k_{21}, k_{22}$ - damping coefficients; $C_{11}, C_{12}, C_{21}, C_{22}$ - coefficient of rigidity. Equation (3) is a linear equation and analytical way easily solved. The calculation results are presented in the table.

ξ	$u м \cdot 10^{-3}$	$\dot{u} м \cdot 10^{-1}$	$\ddot{u}\ м/с$	$\varphi\ град \cdot 10^{-4}$
0,30	0,206	0,047	0,238	0,128
0,15	0,198	0,058	0,256	0,136
0,0	0,210	0,079	0,288	0,146

For the numerical solution and used the following initial data

$$\Delta t = 0{,}005 c; \ \ \varepsilon = 0{,}005; \ \ j_{\max} = 5.$$

Conclusions.

Thus, in the work to develop a method for calculating multi-layer foundation under dynamic stress.

References,

1. OJ Schechter. On account of the inertial properties of the soil in the calculation of vertical forced vibrations massive foundations // Research Institute Simn.12, vibration bases and foundations, Moscow, 1948.

2. G.N. Bycroft. Forced Vibrations of rigid circular plate on a semi infinite elastic space and on an elastic stratum // Phil. Trans. Roy. Soc. London, Sen. A, 248, 1956, 327-368.

4. Juraev T.O. Transient oscillation of deforming semi space on influence of blasting loads. Science and technology, 2013, p. 112.

5. Juraev T.O. Cylindrical protective constructions on influence of blasting loads. Problems of mechanics, №1, 2005, p. 52-55.

6. Safarov I.I., Yodgorov U.T., Juraev T.O., Dzumaev Z.F. About installed oscillations of three laid cylindrical bodies. Problems of mechanics, №1, 2000, p. 31-34.

7. Safarov I.I., Yodgorov U.T., Juraev T.O. Numerical analysis of statistic hardness of shock absorber bushing. Problems of mechanics, №1, 1999, p. 42-46.