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THE STUDY OF THE PHYSICAL AND MECHANICAL PROPERTIES OF SOILS OF CONSTRUCTION SITES OF PRESCHOOL INSTITUTIONS USING INSTRUMENTAL METHODS

Abstract: *The article examines the physical and mechanical properties of the soils of the construction sites of preschools of different sizes and constructions in Fergana by instrumental methods.*

Key words: *dynamic characteristics, seismic, mobile engineering seismometric station, volumetric plan, longitudinal vibration, transverse vibration, amplifier, vibration period, vibration frequency, extinction coefficient, extinction logarithmic decrement.*

Language: *English*

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Introduction

Instrumental - a method of calculation. There are various methods for determining the physical and mechanical properties of construction site soils, engineering and geological research and study of the composition of the strata, determination of physical and mechanical properties of soil samples in the laboratory, granulimetric composition, acoustic methods and more.

In contrast, the Mobile Engineering Station was used to study the physical and mechanical properties of the construction sites of Kindergartens No. 53, No. 45 and No. 4. This section presents the methodology used to study the properties of field soils and the instrumental-computational results obtained, as well as their analysis.

It is known [1,9,17] that in order to determine the elastic properties of soils, data on the velocities of longitudinal and transverse waves in soils and the natural density of soils are needed. The propagation velocities of waves in soils and their natural density can be determined using instrumental methods performed on the construction site under natural conditions, as well as by methods of studying soil samples in the laboratory.

Seismic sensors are installed at the construction site at a certain distance from each other to determine the velocities of propagation of longitudinal and transverse waves in the ground by means of instrumental measurements using the method of seismometry under natural conditions. The seismic sensors installed at these measuring points (MP) must be of the same type and with the same characteristics. For the propagation of waves on the construction site, it is necessary to create an impact force at a certain distance from the first measuring point, for example, hitting the ground with a hammer, dropping a load from a certain balance, creating small-power explosions, etc.

Seismic sensors installed at different measurement points (MP 1, MP 2, MP3) on the construction site in series when the impact force is generated. (t_{1r}, t_{2r}, t_{3r}) and (t_{1s}, t_{2s}, t_{3s}) are recorded. Longitudinal and transverse wave propagation velocities are determined from the records recorded using a mobile engineering station, taking into account the distance between the measurement points from the time difference of the wave fronts at the measuring points ($\Delta t = \Delta t_{i+1} - \Delta t_i$). Other ground characteristics of the construction site are then determined by calculating the wave propagation velocities [10-16].

The following formula is used to determine the velocities of propagation of longitudinal and transverse waves, taking into account the difference in the arrival time of the wave front along the measurement points on the construction site:

$$S_r = L / Dt_p,\ S_s = L / Dt_s \qquad (1)$$

Where: S_r and S_s is the velocity of longitudinal and transverse waves;

L - the distance between the measuring points;

Δt_p and Δt_s are the time of arrival of the longitudinal and transverse wave fronts.

Experimental studies under natural conditions determine the velocities of longitudinal and transverse waves, as well as the extinction decrements (α) and resonant frequencies (ω_0) of ground vibrations. Based on the results of instrumental research, the physical and mechanical properties of the soil of the construction site are calculated using the following formulas [19-31]:

$$\mu = (C_p^2 - 2C_s^2) / 2(C_p^2 - C_s^2), \qquad (2)$$

$$E_г = \gamma C_s^2 (3C_p^2 - 4C_s^2) / 2g(C_p^2 - C_s^2), \qquad (3)$$

$$\sigma_{cд} = C_s^2 \gamma / g \qquad (4)$$

$$K = (C_p^2 - \frac{4}{3} C_s^2)\gamma / g, \qquad (5)$$

$$\lambda = (C_p^2 - 2C_s^2)\gamma / g, G_г = C_p \gamma / g. \qquad (6)$$

The following definitions are used in formulas (2) - (6):

g - the acceleration of gravity; γ = 1,8 t/m^3- bulk density of the soil;

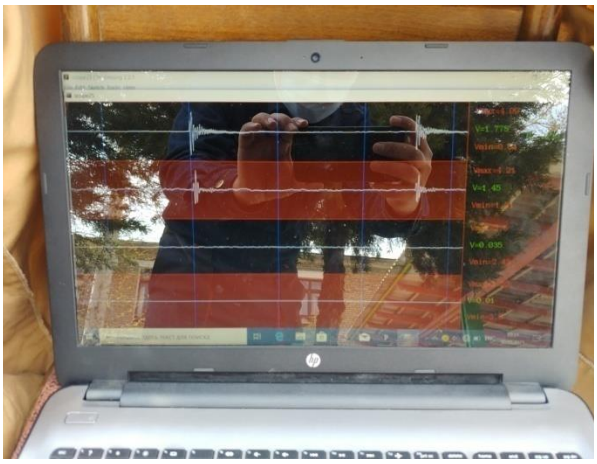
μ - Poisson's ratio; Ye_g - modulus of deformation; σ_{sd} - shift module;

K - the volume compression modulus; λ Lame constant; G_g - the acoustic virginity.

Soil properties of construction sites. Based on experimental studies conducted in the wild, the physical and mechanical properties of the construction site soils of secondary schools were determined.

Figure 1 shows the process of recording the vibrations generated by hitting the ground at the preschool education organization (PEO) construction site No. 53. During the recording of ground vibrations, seismic sensors were placed at a distance of 10 m.

a)



b)

Figure 1. Impulse of No. 53 PEO construction site soil moment of recording vibrations under the influence of forces: a - mobile station; b is the appearance of the recordings on the monitor

Figure 2 shows the recorded ground vibrations at the measuring points MP1 and MP2 as a result of successive hitting the ground at regular intervals.

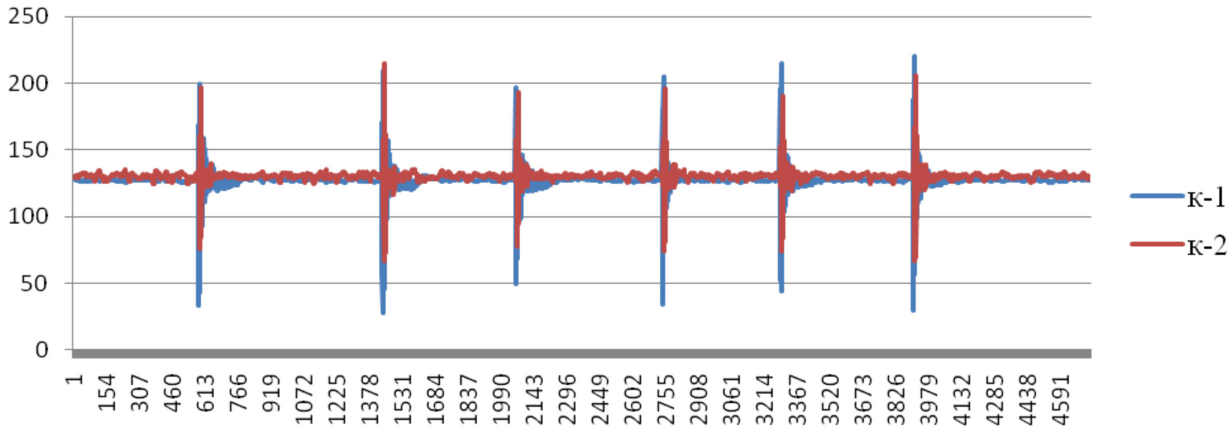


Figure 2. No. 53 PEO construction site with a few pressed primers
There are notes of vibrations when struck

Figure 3 shows the ground vibration generated by a single impact on the ground. The soil characteristics of the PEO construction site No. 53, determined as a result of instrumental measurements and calculations, are given in Table 1.

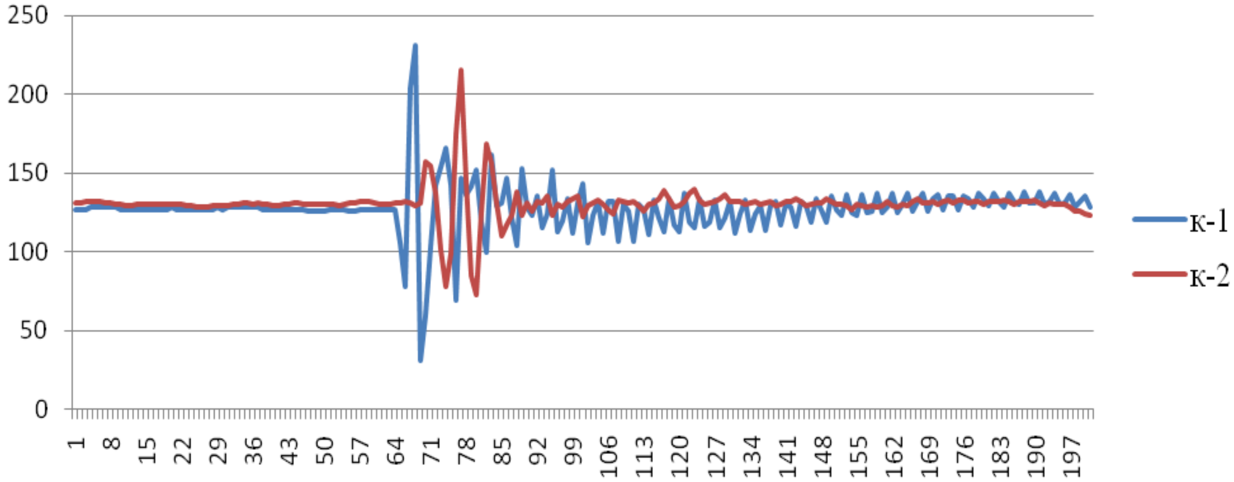


Figure 3. Records of vibration of the PEO construction site No. 53 when the soil is hit once with a press.

Figure 3 shows the process of recording vibrations generated by hitting the ground at the PEO construction site No. 45. During the recording of ground vibrations, seismic sensors were placed at a distance of 10 m.

a) **b)**

Figure 3. Moment of recording the vibration of the ground of the construction site PEO No. 45 under the influence of pulsed forces: a - mobile station; b - the appearance of the recordings on the monitor

Figure 4 shows the recorded ground vibrations at the measuring points MP1 and MP2 as a result of repeated hitting the ground.

Figure 4 shows an elongated version of the ground vibration generated by a single press on the ground. The elastic characteristics of the soil of the construction site PEO No. 45, determined as a result of instrumental measurements and calculations, are given in Table 1.

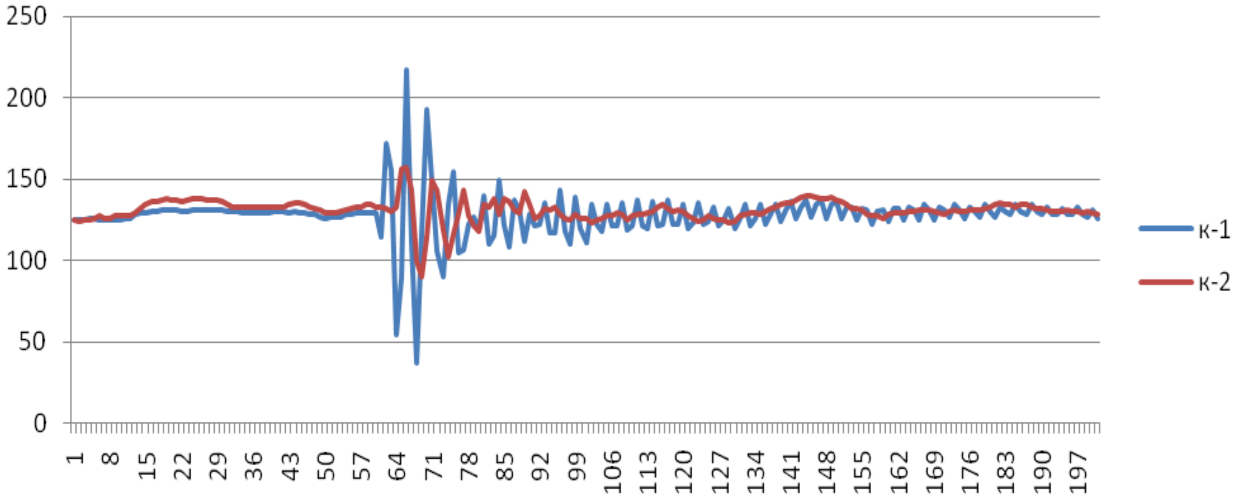


Figure 4. Records of vibration of the PEO construction site No. 45 when the soil is hit once with a press

Figure 5 shows the process of recording the vibrations generated by hitting the ground at the PEO construction site No. 4. During the recording of ground vibrations, seismic sensors were placed at a distance of 10 m.

a) **b)**

Figure 5. Moment of recording the vibration of the soil of the PEO construction site under the influence of impulse forces

Figure 6 shows the recorded ground vibrations at the measuring points MP1 and MP2 as a result of repeated hitting the ground.

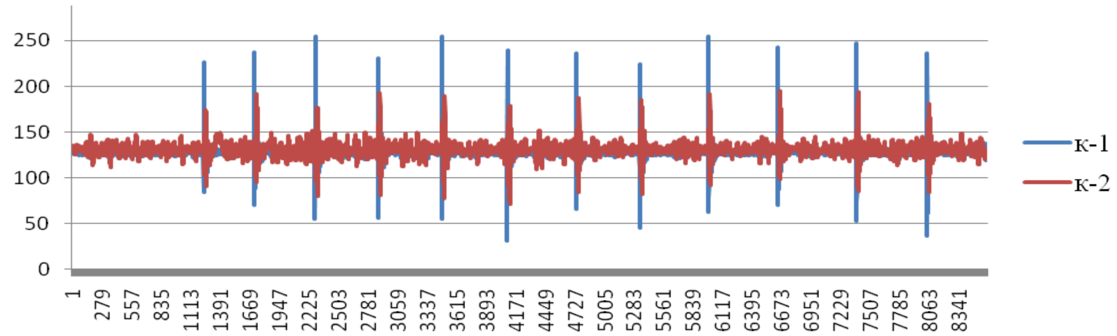


Figure 6. Record the vibrations of the PEO construction site several times hitting the ground with a hammer

Table 1. Characteristics of school construction sites as a result of instrumental measurements and calculations

Instrumental measurement results		Results of calculations according to formulas (7) - (11)					
S_r *m/sec*	S_s *m/sec*	μ	E_g *kG/sm²*	σ_{sd} *kG/sm²*	K *kG/sm²*	λ *kG/sm²*	G_g *kG/sm³·s*
No. 53 Preschool Education Organization							
485	215	0,38	1179,0	849,0	3188,4	2622,4	0,09
No. 45 Preschool Education Organization							
645	214	0,44	1210,0	841,2	6520,0	5959,0	0,12
No. 4 Preschool Education Organization							
322	128	0,41	423,2	301,0	1503,2	1302,5	0,06

Conclusion

The elastic properties of the soils of the tested PEO construction sites were determined by processing the instrumental measurement records using express methodology - Mobile seismometric stations. To do this, the velocities of longitudinal and transverse waves in the soils of construction sites of MTMs were recorded and the elastic characteristics of soils were calculated. The results of instrumental-computational studies have shown that MTMs have different types of soils at construction sites and that the values of longitudinal and transverse wave propagation velocities vary on average in the range S_r = 300÷700 m/sec, S_s = 100÷250 m/sec.

Based on the preliminary results of experimental studies and calculations, it was determined that the MTMs correspond to Categories II and III in the 8-9 point zones in terms of seismic properties of the soils of construction sites. The obtained instrumental-calculation results can be used for technical inspection of buildings and calculations for seismic forces.

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