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# RESEARCH OF DURABILITY OF FOUNDATIONS OF AGRICULTURAL BUILDINGS

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## Annotation

The article deals with the study of the strength properties of clay soils by hardware of triaxial compression and shear device

Thus, the strength parameters (φ and c) have substantially equal values by changing the orientation of the sliding pads potential

Keywords: soil strength parameters, limit state, the trajectory of the load, Coulomb friction law, shear device, hardware of triaxial compression.

Design of the foundations of buildings and structures is based on the Coulomb's wedge theory , and the main parameters are the friction angle (φ ) and grip the ground (C) .Parametry are set according to the results of tests on a triaxial and box shear apparatus .By doing so difference makes it difficult to design the characteristics of the grounds and foundations with the most complete usage of bearing capacity of soil .

In addition, the magnitude of the expected rainfall buildings often do not correspond to the data of field full-scale measurement . Non-conformity is explained among other reasons, and sketchness representations of ideas of process of destruction of soil when used to describe the state of limit equilibrium theory of strength Mohr-Coulomb, Mises - Schleicher-Botkin common in the practical use of the theory of soil strength .

According to the theories of A.L.Kryzhanovskyi [1] in the interpretation of triaxial test data should be considered a limiting condition of the site, Where strength parameters φ and sleep depend on the trajectory of the load and the type of spatial stress state. Limit equilibrium in scheme proposed by A.L.Kryzhanovskyi is considered at sites where adjusting mentions the value of the plastic flow increment become zero .

This work is devoted to the analysis of mechanical processes in clay soil destruction. The results of experimental studies should serve as a basis for improving the description further limit equilibrium of soils in conditions of spatial stress-strain state

These experiments confirm the constancy of parameters of resistance to shift $\varphi_к$ and $C_к$ air-dry soil corresponding equation of Coulomb friction. Moreover, its parameters are independent of the relationship between the principal stresses, the trajectory of the load, the original density of the sample. These factors affect the orientation of the limit equilibrium site.

Thus, it is important the knowledge of the state of incorporation limit orientation sites determined by normal γ (l, m, n), where the conditions of strength, equilibrium, where,

obeying the law of dry Coulomb friction. Orientation slip pad on the proposal of A.L.Kryzhanovskyi views expressed plastic deformation increments $(\mu_{\alpha\varepsilon})$:

$$l^2 = \frac{1}{1 - \frac{d\varepsilon_1^P}{d\varepsilon_3^P}} - \frac{\mu_{d\varepsilon}}{\sigma} \qquad (1).$$

If in the site determined the value of γ ( l, m, n ) according to the formula (1), it sets a limit on the ratio of Coulomb's law

$\tau_\gamma = \sigma_\gamma \cdot tg\varphi_к + C_к$, it is a platform limit equilibrium, where,

$$\sigma_\gamma = (\sigma_1 - \sigma_3) \cdot l^2 + \sigma_3 \qquad (2)$$

$$\tau_\gamma = \sqrt{(\sigma_1^2 - \sigma_3^2) \cdot l^2 + \sigma_3^2 - \sigma_\gamma^2} \qquad (3)$$

Thus, in accordance with the expression (1), the orientation of the sliding pads generally not constant, but is formed in the process of soil deformation. The traditional theory of strength the position of the sliding pads is constant and is defined:

a) by Mohr-Coulomb:

$$l^2 = cos^2\left(45 + \frac{\varphi}{2}\right), \quad m=0, \quad n^2 = 1 - l^2$$

б) by Mises-Schleicher-Botkin :

$$l^2 = m^2 = n^2 = \frac{1}{3}$$

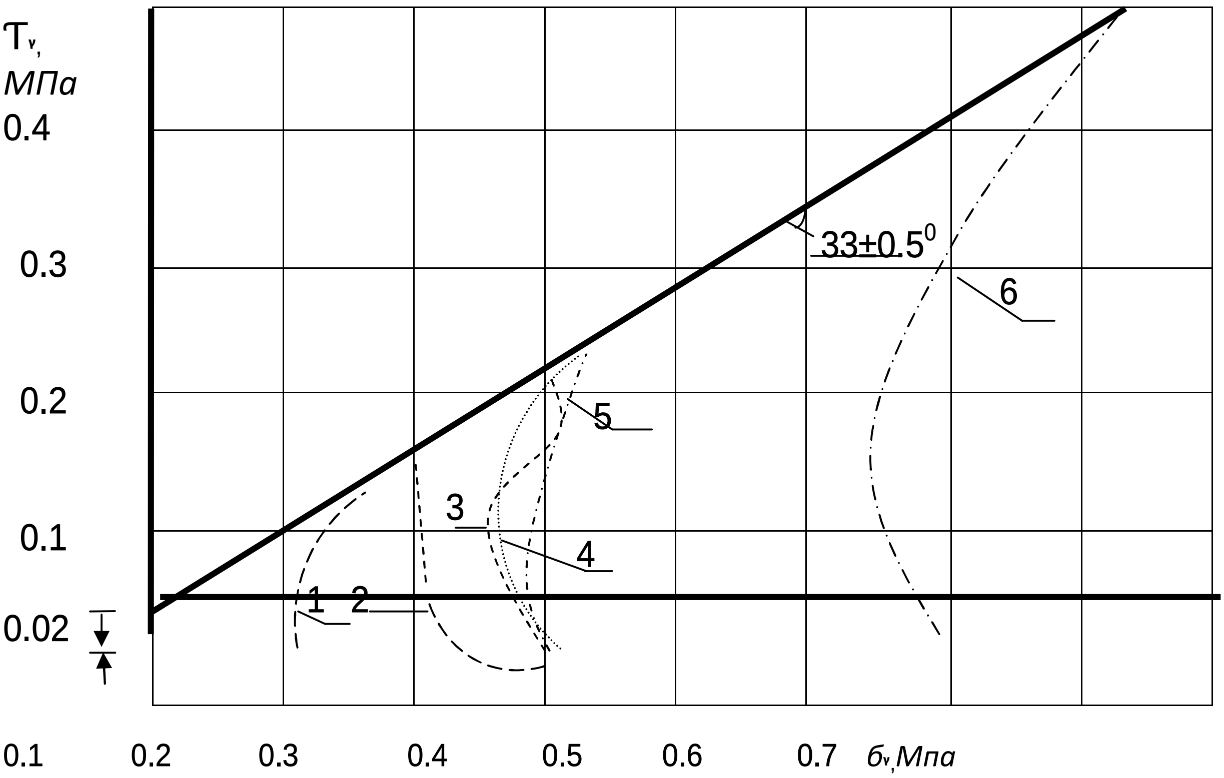
Results of experiences were processed also by a traditional technique of Mora-Kulona, Misesa-Shleykhera-Botkina.

Experiments were carried out on the device with independently adjustable principal stresses with a loam of broken structure ($W_L$= 0,25,$W_P$= 0,17, $\rho_s$= 2,72 г/см$^3$) at different initial density ( $\rho_1$ = 1,50 г/см$^3$, $\rho_2$=1,60 г/см$^3$) and wet ( $w_1$= 0,05,$W_2$ = 0,13).

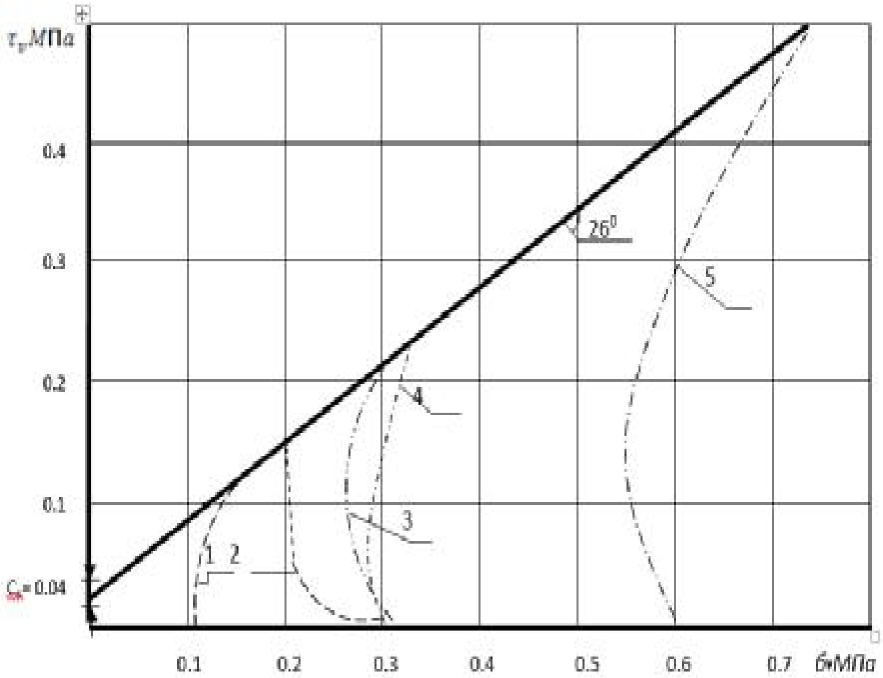
Experiments carried out by loading scheme. On the first phase loading was carried out by the hydrostatic law ($\sigma_1$= $\sigma_2$= $\sigma_3$) till desired condition $\sigma_0$($\sigma_0$= 1/3x( $\sigma_1$+$\sigma_2$+$\sigma_3$ ). In the second phase, it increased the value of the steps of the octahedral shear stress and destruction of the soil.

$\tau_0=\frac{1}{3}\sqrt{(\sigma_1-\sigma_2)^2+(\sigma_2-\sigma_3)^2+(\sigma_3-\sigma_1)^2}$ Permanent $\mu_б$ и $\tau_0$ to failure

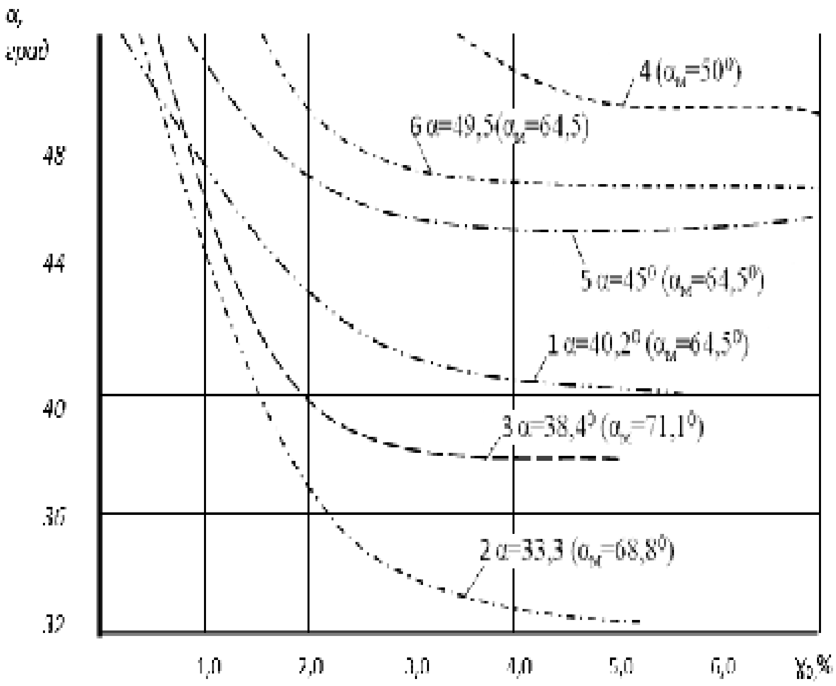
Figure 1 shows the results of experiments carried out with the air-dry loam ($w_1$= 0,05), which is calculated according to the formulas (1),(2), (3), and figure 2 with a water-saturated loam ( $W_2$ = 0,13).



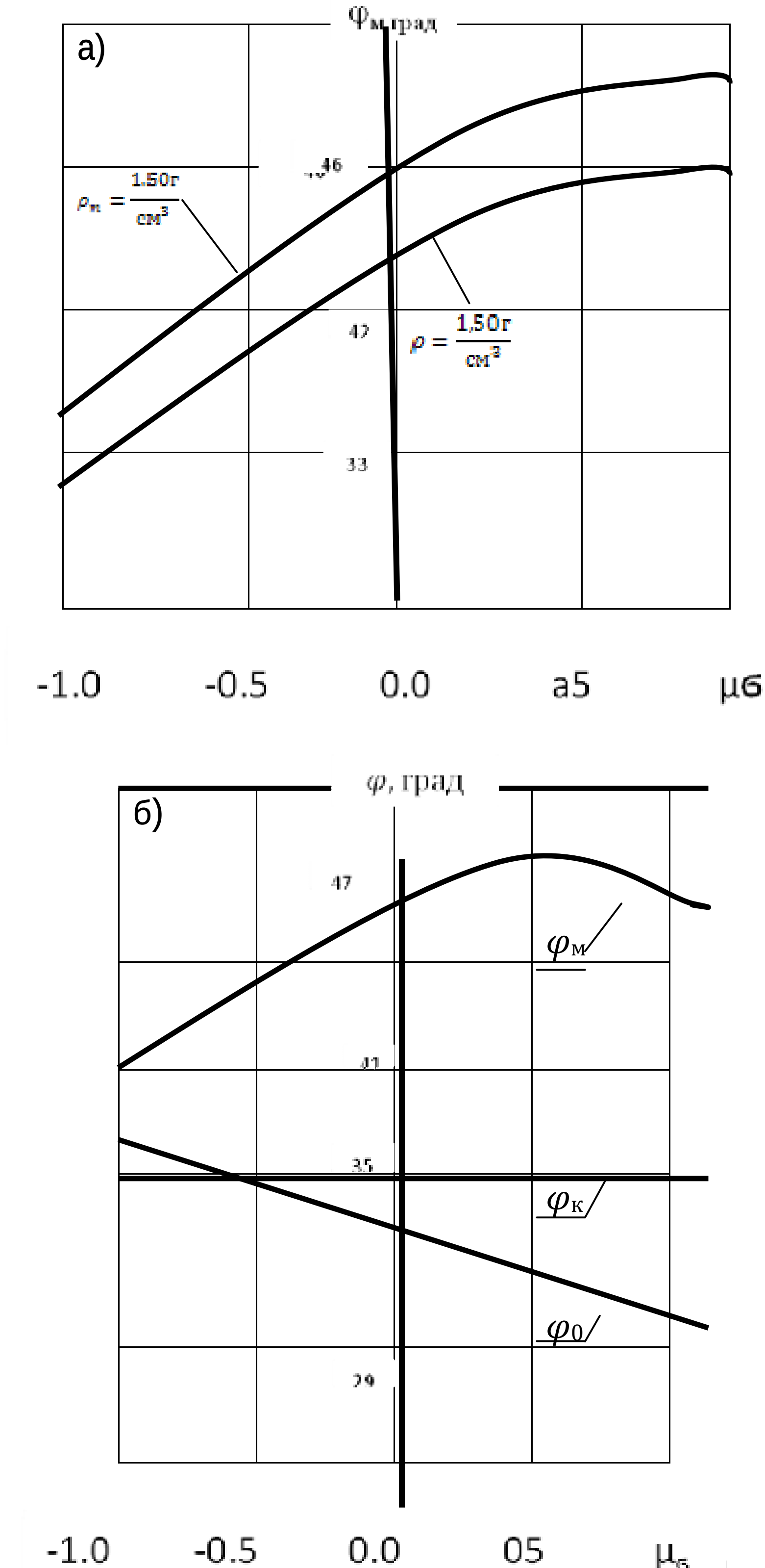

Pic.I. The dependence of the shear resistance $T_v$ in normal stress loam with wet *W=0,05: 1- σ=0.1 Мпа, $\mu_б$=-1.0, ρ=1,60г\см$^3$; 2- σ=0.3Мпа, $\mu_б$=+1.0, ρ=1.6г\см$^3$; 3- σ=0.3Мпа, $\mu_б$=+1.0, ρ=1.60г\см$^3$; 4- σ =0.3Мпа, $\mu_б$=-1.0, ρ=1.50г\см$^3$; 5- σ=0.3Мпа, $\mu_б$=-1.0, ρ=1.60г\см$^3$; 6- σ=0.3Мпа, $\mu_б$=-1.0, ρ=1.60г\см$^3$.*




Pic.2. The dependence then of the normal stress loam with wet $W=0{,}05$: 1- $\sigma=0.1$ МПа, $\mu_б=-1.0$, $\rho=1{,}60$ г\см$^3$; 2- $\sigma=0.3$ Мпа, $\mu_б=+1.0$, $\rho=1.6$ г\см$^3$; 3- $\sigma=0.3$ Мпа, $\mu_б=+1.0$, $\rho=1.60$ г\см$^3$; 4- $\sigma=0.3$ Мпа, $\mu_б=-1.0$, $\rho=1.50$ г\см$^3$; 5- $\sigma=0.3$ Мпа, $\mu_б=-1.0$, $\rho=1.60$ г\см$^3$; 6- $\sigma=0.3$ Мпа, $\mu_б=-1.0$, $\rho=1.60$ г\см$^3$.




Pic.3. Changes of orientation of the potential platform of a limit state: 1, 2, 3, 4, 5, 6 – there corresponds to designations pic 1; in brackets in brackets of slip pad on the Coulomb-Mohr




Pic 4. Chang … ne initial density of the sample (a) и от $\mu_б$ (б)

In works [2-4] it is shown that when testing on the shift device existence of peak and residual durability is revealed. The size of peak durability depends on initial density, on the sizes of particles and some other factors.

Results of the experiments made by us with air and dry clay soil confirm dependence of peak durability on initial density. At the initial density ρ = 1,60 г/см$^3$ peak durability is equal $\varphi_n$=37°,при ρ = 1,60 г/см$^3$ и ρ = 1,66 г/см$^3$ suitable - 40° и *43°. Residual strength at all densities* $\varphi_0$=34°. The residual strength obtained in the shift unit is identical to the obtained triaxle tool.

## Conclusions

1.It is confirmed that in case of determination of resistance to shift not of water-saturated clay soil peak and residual resistance are established. It is shown that peak durability depends
from the initial density of a sample of soil, and residual durability at the same time remains to a constant.

2. The shear strength of the clay soil is described by the dry friction of Coulomb. The values of φ and depend only on the material composition of soil.

3. It is shown that the friction angle φ is nearly equal values in in devices of triaxial compression, and in shear tool .

## References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4. library.psu.kz\index.php The strength of the soil


## Түйін


Бұл мақалада үш осьті аппаратурада және сырғыту аспабында сазды топырақтардың беріктілік қасиеттерін зерттеу мәліметтері келтірілген. Нәтижесінде беріктілік көрсеткіштерінің (φ және с) мәндері бірдей, ол ондағы сырғу жүретін алаңының әр түрлігімен түсіндіріледі.



**Кілтті сөздер:** топырақтың беріктілік көрсеткіштері; шекті жағдайы; жүктемелеу траекториясы;Кулонның үйкеліс заңы; сырғыту аспабы; үш осьті қысу аппаратурасы.


## Резюме


В статье рассматривается изучение прочностных свойств глинистых грунтов в аппаратуре трехосного сжатия и в сдвиговом приборе. При этом, параметры прочности (φ и с) имеют практически равные значения за счет

изменения ориентации потенциальных площадок скольжения

**Ключевые слова:** параметры прочности грунта, предельное состояние, траектории нагружения, уравнения трения Кулона, сдвиговой прибор, аппаратура трехосного сжатия

**Summary**

The article deals with the study of the strength properties of clay soils in three axis Hardware compression and shear device. Thus, the strength parameters (φ and c) have equal values by changing the orientation of the sliding pads potential

Keywords: soil strength parameters, limit state, the trajectory of the load, the equation of friction Coulomb shear device equipment triaxle