rical parameters of working bodies of machines designed for collecting hemp is conducted.

Physical and mechanical properties, conicity, length, diameter of stalks of hemp.

UDC 531.3

CRITERIA OF STRENGTH AND RELATIONSHIP TENSIONS between the components of granular ENVIRONMENT

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The influence of limiting stress shear stress initial displacement, internal and external factor in determining friction loads from the materials to the design, construction and working bodies.

Criterion strength, loose environment, stresses in the environment, soil, shear stress in the environment.

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Formulation of the problem. Many processes in the formalization of materials and mediums used a loose model of discrete environment [1-4]. These models come in cases related to the formalization of soil grain materials, animal feed, processed cereals, legumes and oilseeds [5-7]. However, these materials have significant differences in mechanical properties, particularly extreme tension shear stress initial displacement, internal and external coefficients of friction. Therefore, the formalization of a very important consideration in determining the properties of these traffic conditions such materials by determining loads on construction materials, structures and working bodies. Also important is the knowledge of the values of external influences at having to move these materials and changing their properties.

Analysis of recent research. Therefore, knowledge of communications components such material stress and imbalance conditions is essential. According to a statement Haar and Karman classical theory of plasticity theory and limit equilibrium soils (loose medium theory) have a common ground, so loose environment analysis is performed using the methods of the classical theory of plasticity.

The purpose of research. To analyze the effect of limiting stress shear stress initial displacement, internal and external factor in determining friction loads from the materials to the design, construction and working bodies.

research results. One of the most common and most used medium to loose criteria of full plasticity (limit equilibrium conditions) is Treska criterion according to which the limit equilibrium condition is:

$$\sigma_3 = \sigma_2,\ \sigma_1 - \sigma_3 = 2k, \qquad (17)$$

where: $\sigma_1, \sigma_2, \sigma_3$ - Major tension in the environment;

k - Constant, which characterizes border transfer medium in the plastic state.

To determine the value k (Equilibrium conditions) can be used Mohr circles (Figure 1).

Fig. 1 designation have the following interpretation: τ_0 - Initial voltage offset for coherent loose environment, φ - Angle of internal friction environment $\sigma_1, \sigma_2, \sigma_3$ - Major tension in the environment (according largest, medium and smallest). According to Otto Mohr CA_1 and CA_2 - Line sliding on which there is plastic flow or continuity is destroyed. The ratio between the components of the stress slip lines are as follows:

$$BO = \frac{\sigma_1 - \sigma_3}{2} + \sigma_3 = \frac{\sigma_1 + \sigma_3}{2}; BC = \frac{\tau_0}{tq\varphi};\ OC = \frac{\sigma_1 + \sigma_3}{2} + \frac{\tau_0}{tq\varphi};\ OP_1 = \frac{\sigma_1 - \sigma_3}{2};$$

$$\frac{1}{\sin\varphi} = \frac{\frac{\sigma_1 + \sigma_3}{2} + \frac{\tau_0}{tq\varphi}}{\frac{\sigma_1 - \sigma_3}{2}}; \qquad (18)$$

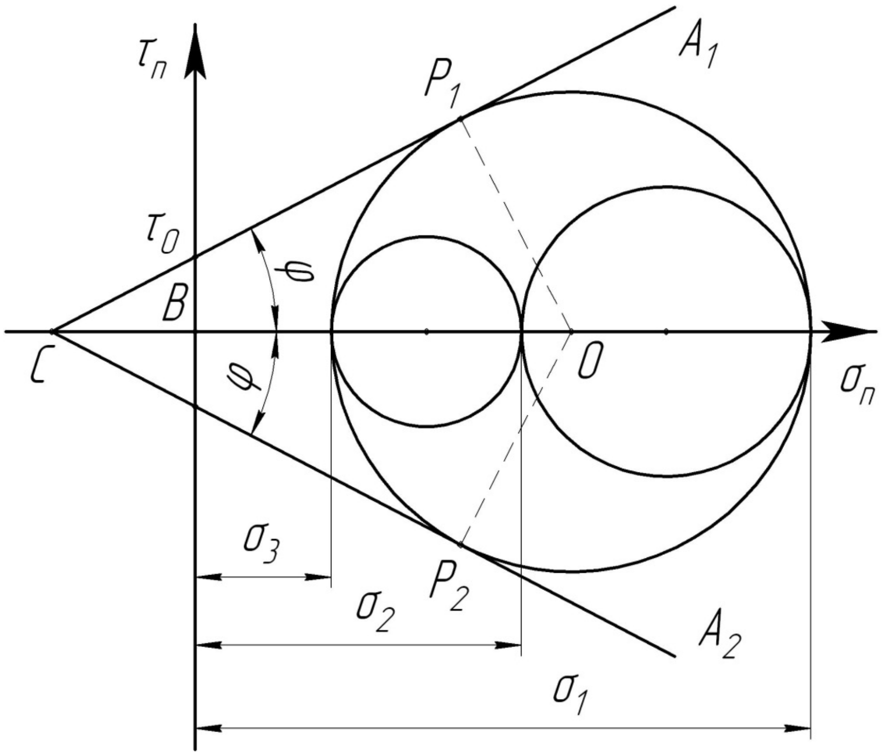

Fig. 1. Circles Mora to determine the relationships between the components of the stress conditions and the onset of plasticity.

From the expression (2) on the lines slip can be the ratio between the properties of the medium components and stresses:

$$\sigma_1 = \frac{\sigma_3 + 2\tau_0 ctq\varphi + \sigma_3 \sin\varphi}{-1+\sin\varphi};\ \sigma_3 = \frac{-\sigma_1 - \tau_0 ctq\varphi + \sigma_1 \sin\varphi}{1+\sin\varphi}. \quad (19)$$

According to submissions by stress Mohr circle of maximum shear stress is: $\tau_{\max} = \frac{\sigma_1 - \sigma_3}{2}$ That under the terms of plasticity Treska:

$$\tau_{\max} = \frac{\sigma_1 - \sigma_3}{2} \le k, \quad k - const \text{ or } \sigma_1 - \sigma_3 = 2k.$$

It should be noted that the constant k for plastic coherent (loose) environment can be obtained from the condition (3) given the fact that:

$$\sigma_3 = \sigma_1 - 2k \text{ at } \sigma_2 = \sigma_3, \sigma_3 = \frac{1}{2}(3\sigma - \sigma_1), \sigma = \frac{1}{3}(\sigma_1 + \sigma_2 + \sigma_3).$$

Substituting equations σ and σ_3 in the first equation (3) and the expression of his constant k gives expression:

$$k = -\frac{3(\sigma \sin\varphi + \tau_0 \cos\varphi)}{-3+\sin\varphi}. \quad (20)$$

Graphically expression (4) at a constant voltage $\sigma = const$ has the form shown in Fig. 2.

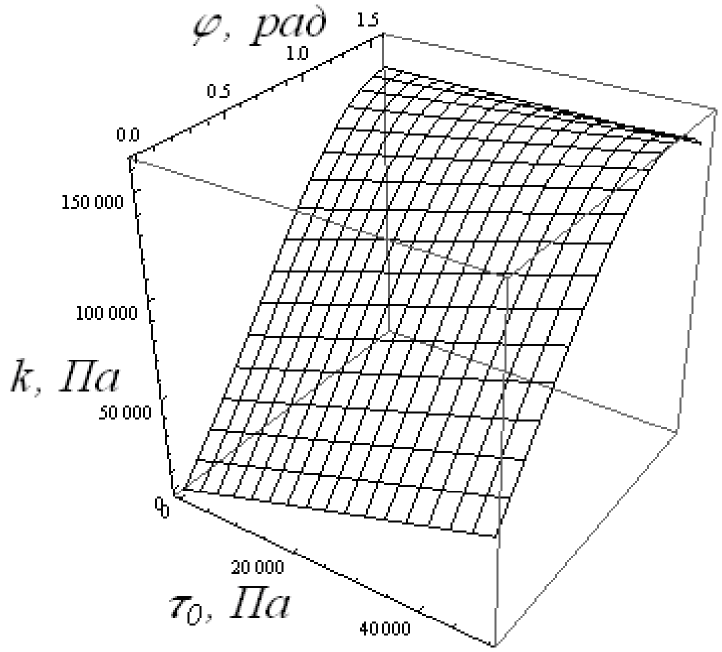

Fig. 2. Dependence constant k the angle of internal friction φ and initial offset voltage τ_0 environment.

To solve the problems of static plastic (discrete loose) environment is necessary to know how stress related components together and what is the relationship they have with the mechanical properties of the medium.

On the ground arbitrarily inclined to the axes xyz the relationship between the components of the stress and main stress is defined by direction cosines:

$$\begin{aligned} \sigma_x &= \sigma_1 l_1^2 + \sigma_2 m_1^2 + \sigma_3 n_1^2; & \tau_{xy} &= \sigma_1 l_1 l_2 + \sigma_2 m_1 m_2 + \sigma_3 n_1 n_2; \\ \sigma_y &= \sigma_1 l_2^2 + \sigma_2 m_2^2 + \sigma_3 n_2^2; & \tau_{yz} &= \sigma_1 l_2 l_3 + \sigma_2 m_2 m_3 + \sigma_3 n_2 n_3; \\ \sigma_z &= \sigma_1 l_3^2 + \sigma_2 m_3^2 + \sigma_3 n_3^2; & \tau_{xz} &= \sigma_1 l_1 l_3 + \sigma_2 m_1 m_3 + \sigma_3 n_1 n_3; \end{aligned} \qquad (21)$$

where there is a connection between the coordinate axes and direction of the main stress by directing cosines:

	1	2	3
x	l_1	m_1	n_1
y	l_2	m_2	n_2
z	l_3	m_3	n_3

Thus there is a link:

$$\begin{aligned} l_1^2 + m_1^2 + n_1^2 &= 1; & l_1 l_2 + m_1 m_2 + n_1 n_2 &= 0; \\ l_2^2 + m_2^2 + n_2^2 &= 1; & l_2 l_3 + m_2 m_3 + n_2 n_3 &= 0; \\ l_3^2 + m_3^2 + n_3^2 &= 1; & l_1 l_3 + m_1 m_3 + n_1 n_3 &= 0, \end{aligned}$$

or

$$l_1^2 + l_2^2 + l_3^2 = 1; \qquad l_1 m_1 + l_2 m_2 + l_3 m_3 = 0;$$
$$m_1^2 + m_2^2 + m_3^2 = 1; \quad m_1 n_1 + m_2 n_2 + m_3 n_3 = 0;$$
$$n_1^2 + n_2^2 + n_3^2 = 1; \qquad l_1 n_1 + l_2 n_2 + l_3 n_3 = 0.$$

Given (1) and (5) stress components can be written as follows:

$$\sigma_z = \sigma - 2k/3 + 2k\,n_1^2; \quad \tau_{xy} = 2k\,n_1 n_2;$$
$$\sigma_y = \sigma - 2k/3 + 2k\,n_3^2; \quad \tau_{yz} = 2k\,n_1 n_3; \tag{22}$$
$$\sigma_z = \sigma - 2k/3 + 2k\,n_3^2; \quad \tau_{xz} = 2k\,n_1\,n_2,$$
$$n_1^2 + n_2^2 + n_3^2 = 1.$$

If the expressions (6) to express normal stresses components n_1, n_2, n_3 and substitute in the equation for τ_{ij} Then we can write:

$$\tau_{xy}^2 = (\sigma_x - \sigma + 2k/3)(\sigma_y - \sigma + 2k/3); \; \tau_{yz}^2 = (\sigma_y - \sigma + 2k/3)(\sigma_z - \sigma + 2k/3);$$
$$\tau_{xz}^2 = (\sigma_x - \sigma + 2k/3)(\sigma_z - \sigma + 2k/3), \tag{23}$$

and:

$$(\sigma_x - \sigma + 2k/3)\tau_{yz} = \tau_{xy}\tau_{zx}; \; (\sigma_y - \sigma + 2k/3)\tau_{xz} = \tau_{xy}\tau_{yz};$$
$$(\sigma_z - \sigma + 2k/3)\tau_{xy} = \tau_{xz}\tau_{yz}. \tag{24}$$

With ratios (8):

$$\sigma_x = \sigma - 2k/3 + \frac{\tau_{zy}\tau_{zx}}{\tau_{yz}}; \; \sigma_y = \sigma - 2k/3 + \frac{\tau_{zy}\tau_{yz}}{\tau_{xz}}; \; \sigma_z = \sigma - 2k/3 + \frac{\tau_{xz}\tau_{yz}}{\tau_{xy}}. \tag{25}$$

And then:

$$\frac{\tau_{xy}\tau_{zx}}{\tau_{yx}} + \frac{\tau_{xy}\tau_{yz}}{\tau_{zx}} + \frac{\tau_{xz}\tau_{yz}}{\tau_{xy}} = 2k.$$

If the Cartesian enter the cosine of the angle of inclination of most major stress to the axes x, y, z : $n_1 = \cos\alpha$; $n_2 = \cos\beta$; $n_3 = \cos\gamma$, then the equation (6) can be determined by the stress component angles largest main tension:

$$\sigma_x = \sigma - 2\left(k/3 + k\cos^2\alpha\right); \; \sigma_y = \sigma - 2\left(k/3 + k\cos^2\beta\right);$$
$$\sigma_z = \sigma - 2\left(k/3 + k\cos^2\gamma\right); \; \tau_{xy} = 2k\cos\alpha\cos\beta; \tag{26}$$
$$\tau_{yz} = 2k\cos\beta\cos\gamma; \qquad \tau_{xz} = 2k\cos\alpha\cos\gamma.$$

These are the conditions for the full value of plasticity (the limit Bulk balance) when assigning to the Cartesian coordinate system.

Conclusion. The resulting constant, which determines the limit state coherent loose material (medium) and the ratio between the components of stress in this environment, as well as the direction of the major stresses that address the problem of static granular connected environment, characterized by internal friction angle and the initial tension shift.

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Showing Effect predelnoho voltage shift, Initial voltage shift, vnutrenneho Factor and Determination of external trenyya at nahruzok co sides on Constructions materials, and constructions of Rabochie bodies.

Criterion prochnosty, sыpuchaya Wednesday, a voltage environment, soils, voltage shift in the environment.

Shows the effect of limiting shear stress, the initial shear stress coefficient of internal and external friction in determining the loads from the construction materials, structures and working bodies.

Strength criterion, loose environment, tension in environment, soil, Shear stress in soil.