Forecasting of Load -Carrying Ability of The Earth file Around of Horizontal Cavities

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Abstract

The scattered destruction of a heavy half-plane with a circular hole under an operation of internal constant pressure is investigated. On a rectilinear side a border of the half-plane is under load. The Suvorov-Akhundov's theory on isotropic bodies' damage is used. In chosen final investigated area a numerical way of the solution is used and border conditions in infinity were transferred on it. Lateral pressure coefficient three values illustrations on time of development of the destroyed area are given.

Index terms— Destruction, tunnels, deformation, stress.

ecessity of stressed and deformed state definition of soil mass around tunnels appears while making underground tunnels and metro lines as well. This is actual as for unfixed tunnel-mine working so as for fixed tunnel. Complexity of this problem is in amount of reological properties of soil variety, nonhomogeneousness, structural changes, particularly connected with destroying process and underground water presence. The bad that metro lines are put in the places where surface construction are presented, also complicates this issue. Calculation method of stressed state of one or two horizontal cylindrical cavities in the soil mass is offered in this research. The problem is solved for the case wish surface deformation taking in to account soil mass stratification, underground water presence, process formation and damage accumulation. The contour of the cavity is effected by the given pressure. The presence construction on the surface is modified according to the given on it power-pressure system.

Numerical algorithm of stressed state calculation and its changeability in time has been developed.

Based this algorithm not only stressed state definition in the area around cavities tunnels appears, but searching of appearing and extending destroying zones as well (fig. **??**).M u u M ? ? ? ? ? ? *

Here M ? is instantaneous ultimate stress limit, u ? is stress intensity For illustrating the process in the figure below specific picture of extending destroying zones around cavities for homogeneous soil masses (?, ?, ? -the areas of consequent destroying) is given.

From numerical experiment the influence of the factors soil mass weight, its stratification, damage tunnel location according to surface construction, underground water and others on the process if tension redistribution in round-tunnel space has been identified. The given calculation method is used while projecting of Baku metropoliten constructing area. It gives us chance to predict long stable soil mass characteristic around put tunnel. The importance of the suggested method is that it is applicable for tunnels of small put at overconstructed area of tunnel pass existence. a) Properties i. The main defining correlation are ij ij ij ij ij ij ii ii ij ij ? S ? G S K ?? ? ?? ? ? ? ? ? ? ? ? 3 1 ; 3 1 ; ; ; 2 ; 3 0 0 ? ? ? ? ? ? ? ?ij ij ij M G N K G K M G ?? * 0 * 0 0 0 * 0 2 1 3 1 2 1 3 1 3 1) 1 (2 1 1 N

ii. The criterion of failure will beM u u M ? ? ? ? ? ? * 2

Here M ? is instantaneous ultimate stress limit, u ? is stress intensity 3? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? u 3 i.

Since, the problem is a plane one then equations of motion will be will have the following form? 0 0 2 22 1 12 2 12 1 11 ? ? ? ? ? ? x x x x 4

Here ? is specific gravity of rock.

Equations of deformation compatibility,2 1 12 2 2 1 22 2 2 2 11 2 2 x x x x ? ? ? ? ? ? ? ? ? ? ? ? ? 5

The criteria were given by means of stresses, therefore we express the problem trough the stresses. For that, taking into account (1) and (5), we obtain the following system ?1 3 1 3 1) 1 (**2 1) 1 (1** ** 2 1 2 1 3 1 3 1) 1 (2 1 x x x x M G N K G K M G x x M G x x x x x x M G G K x x M G 6

This system of equations with equilibrium equation (6) forms by stress component an isolated system of equations. As was noted, in the system Analytical solving of (6) is very difficult therefore here numerical method and finite net method were applied. For that we pass from infinite half-plane onto finite rectangle. Its incremental dimensions are defined during the numerical computations. Damaging operator is of the form, [1]

Figure 1: M

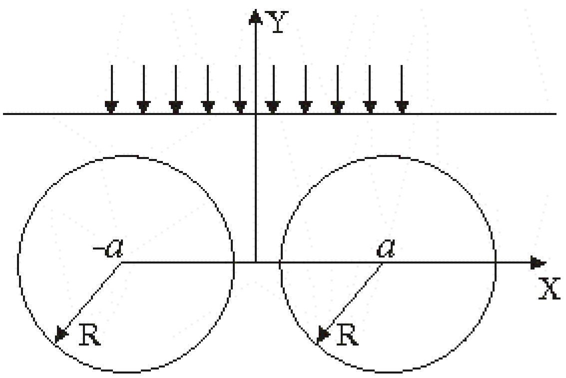

Figure 2:

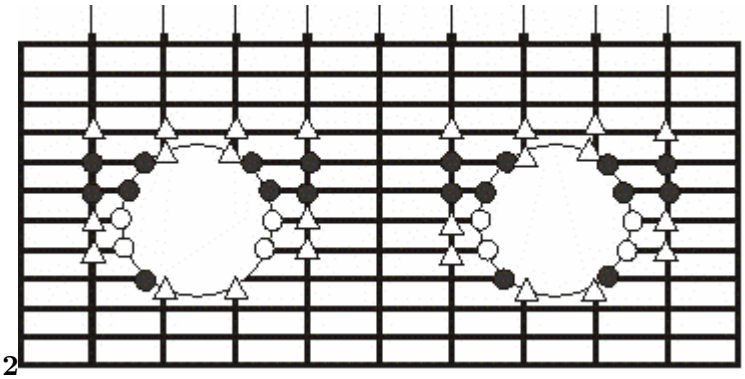

Figure 3: Figure 2 .

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