On the deformation stability of the rock massif

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Large-scale catastrophic destruction in the rock mass in the development of solid minerals are quite rare natural phenomena. A characteristic feature of these phenomena is a sudden, spasmodic change of state as a result of the destruction of one or another mining structure within the development system used.

With the development of underground mining, a system of voids gradually forms and develops, sometimes filled with a bookmark or collapsed rocks, which most of the time of its existence is stable, subject to minor, local destruction. During this period, the parameters describing its state change continuously, without significant jumps. It is in this mode, taking into account the specific mining and geological conditions of the field, that any development system used in mines and mines should function. Those, some damage is allowed that does not lead to a complete collapse of the system.

However, sometimes there are situations in which the continuous nature of changes in the parameters of the system is disturbed, which leads to loss of stability and catastrophic destruction, both in workings and on the earth's surface. We note the necessary conditions for the occurrence of such damage.

Firstly, in this array, in this case, one can always identify structural elements that play the role of a "loading system" (hereinafter "the system") and the "loaded element" ("element") itself which mainly absorbs the load

Secondly, the considered catastrophic damage is always associated with the initial destruction of the "element"and the subsequent movements of the rock mass. In this case, the destructive factor is the potential energy of rocks, which rather quickly passes into the kinetic ("loading system").

Thirdly, the force interaction of the "system" and the "element" should occur in the mode of "soft" loading. In general, this means that in some sense, the deformation characteristics of the "system" and "element" should provide a higher flexibility for the "system" than for the "element". "System"and "element"are deformed together, i.e. the principle of compatibility of deformations must be followed, expressed, in particular, in the continuity of displacements at their common boundary. Moreover, in the case of "soft" loading, these displacements are determined mainly by the deformation properties of the "element", while for "hard" loading, the properties of the "system".

Usually, during the preparation of a catastrophic phenomenon and during its course, the rock mass is deformed in such a way that the "system" is unloaded, i.e. its deformations increase, and force factors (say, stresses) decrease.

At the same time, for the "element" there is a loading described by the corresponding strain diagram, in the general case with an exorbitant branch. Note that catastrophic destruction will occur at a point on the drop-down branch of the diagram. It is characterized by the fact that in addition to the equality in it of the force and deformation factors for the "system" and "element", it maintains the equality of the rates of change of these factors under loading for the "system" and "element".