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Recommended Support Structures for Excavations in Difficult Mining and Geological Conditions

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ABSTRACT: In difficult mining and geological conditions, the support should be erected close to the face plane, and in some cases it is recommended to use advanced support or advanced strengthening of rocks. Not all support structures are technologically possible to erect close to the face plane, i.e. without lag since they are most often damaged by blasting and require replacement or repair. In addition, capital and part of the preparatory workings have a long service life. And for this entire service life, the cross-section of the development “in the light” must remain unchanged so that technological and structural gaps are maintained. In the world practice of maintaining capital and preparatory mining, preference is given to the following types of lining: monolithic concrete and reinforced concrete, sprayed concrete, anchor lining.

KEY WORDS:stable, monolithic,rear sight,rocks, workings, sandstone, stress, deposits, cross-section, depth, massif, fortress, coal, trunk, anchor, lining, density, circle, four-angle, thickness, spray concrete.

I.INTRODUCTION

The manifestation of rock pressure in mine workings is due to the influence of a large number of natural geological and production factors. However, the stability of the rock outcrops of the mine and the surrounding rocks depends mainly on the physicomechanical properties of the rocks and the stresses acting in them, due to the mass of overlying rocks, tectonic processes and the intensity of mining operations.
Therefore, all methods of maintaining and protecting mine workings can be divided into the following groups:
• use of favorable geological conditions (highly stable and stable rocks);
• hardening of rock mass;
• unloading of rock mass;
• application of various support structures;
• combined methods (including the use of combined and lightweight support structures).
The reason for this grouping is that most mining operations are not focused on a specific group of maintenance and safety. In complex mining and geological conditions, the practice shows that it is necessary to regulate the level of many influencing factors and to actively use the mining industry, but these opportunities are not fully utilized.

II. SIGNIFICANCE OF THE SYSTEM

It depends, first of all, on the correct selection of the type of body, the size of the fasteners, which depends on the function and the service life. In complex mining and geological conditions, corrugated reinforces should be built close to the work surface, and in some cases reinforced rock or reinforcing rocks are recommended. It is not possible to install all structural fasteners close to the work area, because the fasteners are often damaged by blasting and need to be repaired or replaced. In addition, most of the capital and mining companies have long service life. During this service, the cross-sectional surface of the polish should remain intact, and in order to maintain the technological and structural space, these reinforced concrete types are recommended for reinforcing capital and fabrication pits according to world practice: monolithic concrete, reinforced concrete, cast concrete and anchor fasteners. [1]

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III. LITERATURE SURVEY

The main types used in almost all mines and mines in the country are: monolithic concrete, combined reinforced concrete (together with ankle, anchor) and metal profile SVP (22, 27). The use of flexible construction fasteners does not solve the problem of maintenance of the boats, but has their disadvantages: the change of the cross-section surface of the tiles as a result of shifting of the reinforcing elements.
The next step involves the replacement of the fastener and the repair of the polish. This poses a certain risk to workers and results in additional labor, costs and material costs (Table 1). The analysis of the following factors in the consolidation of underground deposits shows that there are two situations in which the above requirements are met: firstly, almost all ore deposits are subjected to shock after a certain operating depth, and secondly, to the presence of steep slopes. In mining, it is important to take into account the breakdown of the mining furnaces as a result of the massive displacement of rocks associated with the mineral body.[2]

Table1.Recommended for the stability of rocks types of reinforcement

Stability category	Stagnation	Rocks shift	Recommended type of fasteners	Special conditions
I	It's too sturdy	no	Without the hitch	-
II	Stable	Time lapse	Without the hitch	In order to prevent a change in the strength of the rocks as a result of erosion, insulation with a hairproof up to 30 mm is required.
III	Moderately stable	Shutdown while moving	Reinforced concrete, anchor fasteners, steel polymer anchor fasteners, towel,	It is advisable to use combined reinforced concrete reinforcement (anchor reinforcing with hairstyle) to change the strength of rocks after irradiation.
IV	It is unstable	It does not quench during movement	From reinforced concrete anchors (reinforced concrete or steel polymer) and toothpicks	An reinforced metal grille is recommended
V	Very unstable	Rocks that are in the crustal area, separated by complex fractures, are prone to weathering and moisture. May fall in excavation.	Monolithic concrete, reinforced concrete reinforced concrete	Anchor fasteners should be used in combination with hairpins and metal bars

IV. METHODOLOGY

Camera durability refers to the fact that technological processes are properly implemented and that workers' safety is ensured without additional measures. At the same time, in the area where the chamber is dug up for storage, the ore body or adjacent rocks are left intact. According to the technology used, the molds are extracted after the bulk of the mineral is drilled or buried under sections and horizons. If molds are left behind, this technology will increase the loss of minerals. If the mucus is recycled, it is usually required to use a specific extraction system. From a geomechanical point of view, the function of mites is to prevent deformation (deformation) in the surrounding mass and expansion of disturbance zones. If the size of the mucus is greater than necessary, there will be a loss, but if the size of the mucus is smaller than the required size, then it will break. Fractures in these molds can create hazardous landslides and can also break the mold in adjacent areas. This situation also influences the stagnation of the cells in the rock mass and the deformation properties of the rocks. Therefore, for each mining and geological conditions, the shape and size of the

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cells must be properly selected, taking into account the maximum forces that can affect the cellular porosity, this necessitates the organization of safe operation.[3]

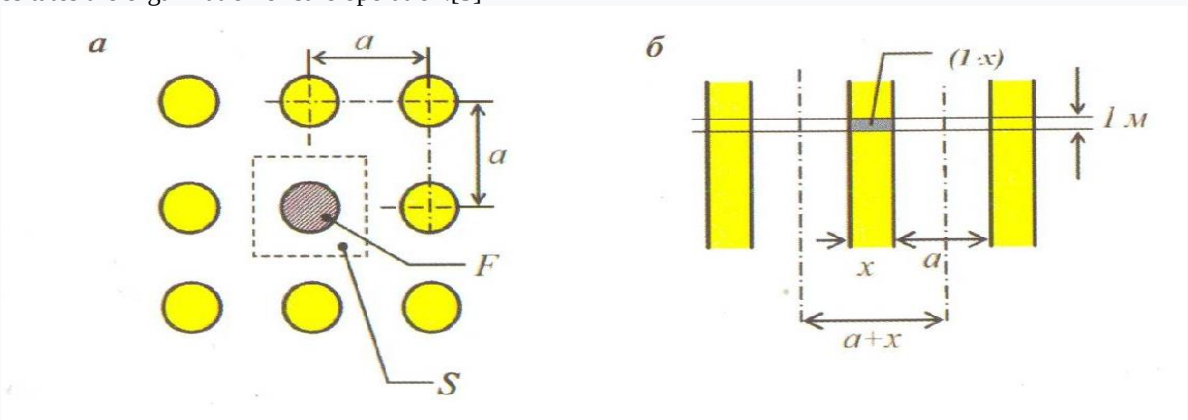

Fig1.Schematic of the shapes and sizes of slits in cells.a) table mucous; b) tape mucus. *a*- the center of the a-droplet mucous (prolet);*S*- is the field of action of the force acting, *F*- is the cross-sectional area of one mucus, and *x*- is the width of the missed mucus.

The damping effect (γ) on the inter-chamber interface depends on the density of the rocks, the drop-off velocity (*H*) and the tensile strength (*S*)ie: [4]

$$N = \gamma HS$$

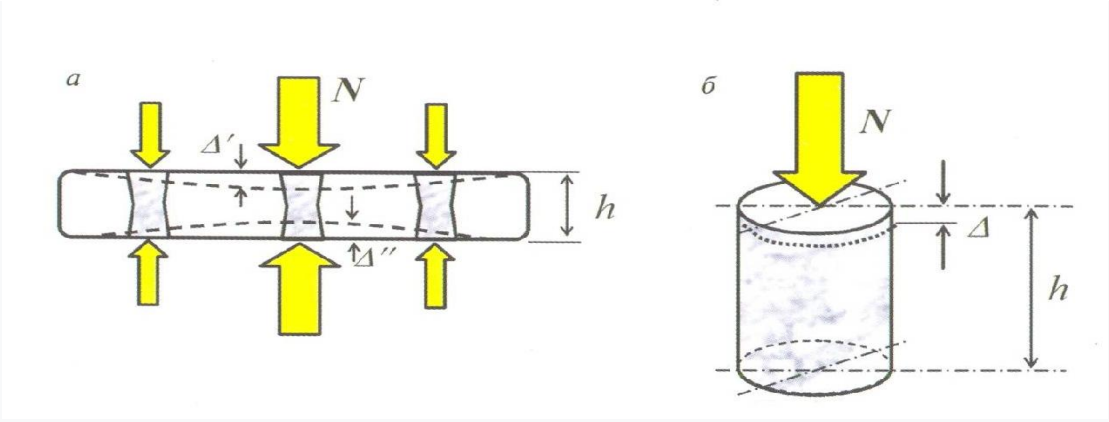

Fig 2. The force acting on the countertop

The vertical voltage is determined as follows:

$$\sigma = \frac{N}{F} = \frac{\gamma HS}{F}$$

The effect of 1 meter of ribbon sliding is determined by the following formula:

$$N = \gamma H(a + x) * 1$$

The vertical voltage is as follows:

$$\sigma = \frac{N}{1 * x} = \frac{\gamma H(a + x)}{x}$$

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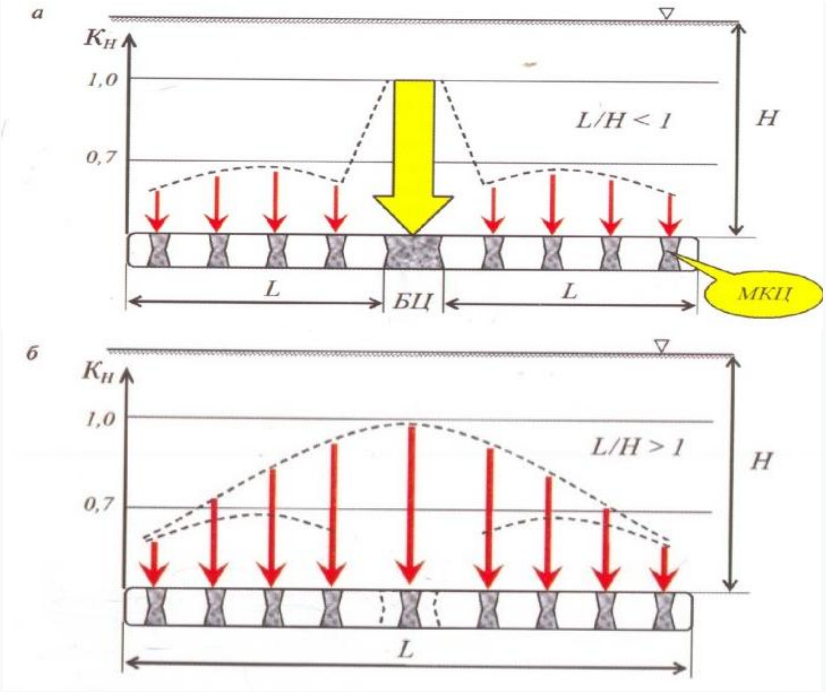

Fig3. Graph of the loading coefficient on the width of the extraction coefficient. *БЦ*-barrier mud, *МКЦ*-chamber melt, *H*-extraction depth. *L*-extraction width.

The load coefficient in *Kн*-sel is determined as follows:

$$K_н = \frac{N}{\gamma HS}$$

V. EXPERIMENTAL RESULTS

Experience in mining operations in difficult geological conditions shows that the degree of influence of rock stability can be controlled by the correct choice of type and parameters of lining.In order to maintain the mine workings, it is recommended that lightweight constructions are generally used as the most economical, and in some cases combined constructions, such as Bernoldlining.An analysis of the factors affecting the quality and reliability of the lining shows that the use of polymeric materials for fixing anchors should be approached in a special way due to the change in their strength over time.Swellex hydraulic expansion anchors in combination with OM reinforcing compounds are especially reliable.

VI. CONCLUSION AND FUTURE WORK

Selection schemes can include: inter-chamber molds of the same shape and size; periodic molds of various shapes and sizes; irregularly shaped and shaped mucous membranes; solids of different shapes and sizes. The ribbon and the mucous membrane serve different conditions. Tape should be used in the case of flat (oats) deformation, and in the case of columnar molds under conditions of one-axis voltage. Accordingly, to determine the optimum parameters of the extraction system, including the amount of molds left in the excavation chambers, the entire system: excavation tile - sliding - shaft ceiling - is the state of tension-deformation occurring in the upper rocks. Analytical methods and mathematical modeling are the most convenient ways to investigate similar systems. At the same time, it is possible to fully evaluate the state of the system as well as its individual elements.

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