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Geomechanics of Interaction of Frame-Anchor Support
Elements of Extraction Drifts in Solid Load-Carrying System

At present, frame-anchor supports of mine excavations with different types of anchors are becoming more popular at coal and ore mines of Ukraine: they perform two basic functions. Firstly, they reinforce border rocks fostering resistance to active stresses from the side of rock massif by forming load-carrying rock structure. Secondly, anchors are constructively connected with frame support elements and thus create additional bearing point of frame support owing to tension capacity.

Anchors and frame support used together result in frame-anchor support which is notable for reduced materials consumption at high load-carrying capacity, so these supports could be used efficiently as mine excavations support in difficult mining and geological conditions.

While developing and validating geomechanics model in all three blocks of exploration the following requirements were taken into account:

– modeling of all lithological differences (in the distance no less than 15 m from contour of mine working) on full diagram of their deformation from elastic-plastic condition to the stages of weakening and dislodgement of rock and coal;

– reflexion of contacts displacements between nearby lithological differences around mine working;

– modeling of real geometry of frame support and resin-grouted roof bolts and calculation of their strain-stress state in elastic-plastic set-up;

– reflexion of all construction peculiarities of bonding of spatial-yielding connections of side anchors to frame props;

– modeling of real working characteristic of yielding joint of frame support in its simulation by substitutions similar sized, shaped and located elastic elements from easily deformable material. Stress-strain modulus **E** is assumed equal to steel 5, and fluidity point is defined by formula: $\sigma_{fl}^{st} = 0.8P\sin\alpha/2F$, where F – area of cross-cut of SCP (special concave profile); P – bearing capacity of frame; α – angle of the joint's center to vertical axis of the mine working.

According to results of "massif-frame-anchor" system modeling, frame-anchor support with spatial-yielding connections of side anchors and frame props having plate with high hardness in roof armour-rock is the most preferable in supporting mine workings at mines with difficult mining and geological conditions:

– areas of plastic condition of frame props are fully eliminated, which is caused by dramatic decrease of bending stresses while creating additional support with flexible plates. Moreover, even light-duty special shape SCP-19 provided more than double strength margin;

– degree of working stresses in frame beam corresponds to such in props.