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Assesing a risk of roof fall in the development mine workings in the process of longwall coal mining in terms of Ukrainian mines

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Purpose is the analysis of the available approaches used to determine risks of injures of miners and the development of a new method to assess risks of roof fall in the development mine workings, which maintain long stopes of coal mines.

Methods. The paper applies a complex approach involving: analysis and generalization of previously carried out research of injuries of miners in the process of underground mineral extraction; analysis of methods to assess risks inclusive of injury
risks; methods of mathematical statistics while processing risk information; planning of experiments while constructing questionnaires and expert groups; methods of expert estimations while developing proper technique of risk assessment; and cluster analysis while processing the examination results.

Findings. It has been determined that the majority of coal mining countries consider the “roof fall” factor as one of the most dangerous ones. Insufficient reliability of support systems is the key reason of injury of miners as a result of roof falls.

Methodology of roof fall and injury of miners has been developed basing upon a probability analysis as well as upon the use of a method of expert estimations. Adequate consistency of the expert estimations has been proved by statistical methods, and the cluster analysis elements. Classification of risk levels, corresponding to inrush probability and taking into considera- tion the importance of each factor, has been proposed. Analysis of the proposed methodology to assess injury risk as a result of roof fall has made it possible to determine that irrespective of the inrush hazard, extra anchoring helps reduce a level of such an inrush probability down to 8.9% (when weight variation is 1 to 4). Hence, anchoring is the viable tool to reduce injury level of miners.

Originality. The basic factors, effecting injury risk of miners as a result of rock inrushes, have been identified. Importance of the factors has been defined. Regularities of changes in risk of rock failure and its inrush from a roof of the development mine working in the process of longwall coal mining, depending upon the abovementioned factors, have been obtained. Roof rock rigidity, condition of the main support, and anchoring are key ones among the factors.

Practical implications. The obtained results may be applied to assess roof fall risk in the development mine workings, which maintain long stopes of coal mines. The necessity to take extra steps aimed at the improved labour safety and basic contents of the measures is based upon the aforesaid.

Keywords: *injuries risk, rock inrush, development mine workings, longwall, anchoring.*