STABILITY OF A SMALL ROOM & PILLAR IRON MINE IN SPAIN

Abstract:
The author first briefly review the rock mechanics works carried out to analyze the stability of an old room and pillar hematite mine. Field work was initially carried out to recover a good number of discontinuity data, also a number of rock samples for lab testing were collected. UCS and triaxial tests were performed and rock masses were characterized in order to estimate rock, pillar and rock mass properties. Based on this information room stability and pillar strength and stability studies were carried out in all the relevant areas of the mine to find out a general good level of stability. Only in a location of the mine incipient instability problems were detected. Simplified stabilization methods were proposed, and implemented, including the construction of a timber crib and the perimeter cabling of not-so-stable pillars in order to avoid rock-fall and progressive failure. In situ measurements confirm the suitability of the approach.

In order to deep in the understanding of how strapped pillars work, a number of studies were carried out. First cabled rock specimens were tested in the laboratory by uniaxial compressive strength tests and result were compared to standard sample results. With this background, together with understanding of rock post-failure behaviour, some pillar behaviour models are proposed. They were used to carry out numerical models of this type of pillar. Using FLAC and UDEC, it has been possible to develop models representing pillar response. These models add to the knowledge of pillar behaviour and improve our control of both standard and cable-strapped pillars, in terms of stress-strain evolution, plastic response, and the energy that the pillars are able to absorb. Ultimately it is suggested that a few steel cables placed around mesh-wrapped pillars can work as an effective means to improve pillar stability and control mine deformation, under particular circumstances.

Bio:
Dr. Leandro R. Alejano is a professor in the Department of Natural Resources & Environmental Engineering at the University of Vigo (Spain). He is president of the Spanish Group of the International Society of Rock Mechanics and Rock Engineering (ISRM) and he was recently appointed Vice-President for Europe of the ISRM.

He obtained a PhD in Mining Engineering at the Department of Mining Engineering, Universidad Politécnica de Madrid, Spain, in 1996, on the topic of numerical modelling of coal subsidence. He was appointed as an associate professor of Rock Mechanics at the University of Vigo in 1998 and has since been in charge of teaching and research programs in rock mechanics for mining. He coauthored a book on basic rock Mechanics in Spanish. He is member of the Commission on Testing methods of the SRM.

In addition to his academic work, Professor Alejano is consultant for mining, quarrying, construction and energy companies at a national and international levels. Prof. Alejano’s research interests include rock and rock mass behavior with particular attention to post-failure behavior, tunnel design, rock slope stability and mine design and control.