A New Approach to Estimate Joint Roughness Coefficient and its Influence on Bond Strength of Steel Fibre Reinforced Shotcrete

D. Kumar[*], P. K. Behera, U. K. Singh

Department of Mining Engineering, Indian School of Mines, Dhanbad, India
*Email: dheeraj@dkumar.org

ABSTRACT

Using linear variable displacement transducer (LVDT) and potentiometer along with data acquisition system, an instrumental setup has been fabricated and corresponding software is developed to plot profiles of rock surface and determine their roughness. Three parameters namely root mean square of first derivative of the profile (Z_2), structural function (SF) and length of rock profile (RL1) have been used to numerically characterize roughness of the rock surface. The joint roughness coefficients (JRC) is estimated by using the equation suggested by Yu and Vayssade (1991), considering the sampling interval of 1 mm. In order to determine the strength of bond between steel fibre-reinforced shotcrete (SFRS) and rock surface, an instrumental setup has been devised. The different coal measure rocks like shale and sandstone (coarse, medium, and fine grained) were acquired from various mines. A thorough laboratory study of adhesion of shotcrete to same rock with different surfaces roughness shows that roughness of the rock surface plays a more significant role in bond strength, for a particular range of JRC between 8 and 17. For a particular range of JRC, bond strength is strongly influenced by the values of JRC.

Keywords: Joint roughness coefficient; Bond strength; Rock profile; structural function