

The Application of Distributed Optical Strain Sensing to Measure Rock Bolt Deformation Subject to Bedding Shear

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Abstract : Shear displacement along bedding defects is a well-recognised behaviour when tunnelling and mining in stratified rock. This deformation can affect the durability and integrity of installed rock bolts. In-situ monitoring of rock bolt deformation under bedding shear cannot be accurately derived from traditional strain gauge bolts as sensors are too large and spaced too far apart to accurately assess concentrated displacement along discrete defects. A possible solution to this is the use of fiber optic technologies developed for precision monitoring. Distributed Optic Sensor (DOS) embedded rock bolts were installed in a tunnel project with the aim of measuring the bolt deformation profile under significant shear displacements. This technology successfully measured the 3D strain distribution along the bolts when subjected to bedding shear and resolved the axial and lateral strain constituents in order to determine the deformational geometry of the bolts. The results are compared well with the current visual method for monitoring shear displacement using borescope holes, considering this method as suitable.

Keywords : distributed optical strain sensing, rock bolt, bedding shear, sandstone tunnel

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