Determination of cable bolt physical properties in cement grout

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The Spokane Research Laboratory, is investigating the physical properties of cable bolts with instrumented king wires in cemented grout. Although many researchers and mine engineers have conducted a large array of tests on cable bolt load characteristics, with different grout types, grout ratios and physical attributes to the cable or on the cable (garford, buttons, birdcage, nut cage, etc) limited studies have been conducted on internal instrumented cables. During the test as the grout transfers the axial load to the cable the strain-gauged king wire will give a micro strain reading. The testing consisted of three pull tube assemblies, six feet in length with a split in the middle. The instruments were placed at 3-in intervals along a six-foot embedded cable.

The load /strain is repeatable, the major differences are in the first 10,000-lbs, where each curve has independent settling characteristics. The 3 to 9-inch gauge locations experience a large share of the applied load with the 3-inch gauge depth almost representing a non-grouted cable. The 6-inch location reaches the elastic limit of the cable with the occasional 9-inch location also obtaining this load. The 30-inch locations only see small strain at over 40,000-lbs of load.

The niosh cable provides a source of reliable point measurements where previously none was possible under field conditions. This enables one to evaluate / research the affect of cable confinement; grout quality, rock mass stiffness and other factors. The niosh strain gauge cable bolt is a unique field and research tool. It is able to predict point loading along the cable and thereby interpolate the maximum possible loading on a cable.

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