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## A comparison of the performance of fully versus partially encapsulated cable bolts based on laboratory-scale testing

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### **ABSTRACT**

A study was undertaken to quantify the differences in performance between a fully encapsulated cable bolt and a partially anchored cable bolt. Much research has been reported on the differences in cable bolt design and operational parameters such as borehole diameter and grout type with much of this based on the Laboratory Short Encapsulation Pull Test (LSEPT). However, there is a gap in knowledge surrounding the effect of anchorage length on load transfer or cable bolt performance. This knowledge will help to inform the current debate on the merits of de-coupling of a cable bolt.

The objective of this study was to expand on the existing database of cable bolt installation practice with the intention of developing a revised design criterion that justifies the use of either fully encapsulated or partially anchored cable bolts for use in ground support in underground construction. Alongside a comprehensive review of current cable support theory, design and practice, a series of pull tests was undertaken to compare each anchorage method using a high capacity modified cable bolt.

The results serve to confirm earlier work on fully encapsulated anchorage. Both the peak load capacity and residual load of the fully encapsulated cable bolts were approximately 50% higher compared to the partially anchored cable bolt. On the other hand, the stiffness of the partially anchored system was slightly higher. When the tests were repeated in an oversized borehole, the differences tended to be more exaggerated. In addition to anchorage length, there are other factors that contribute to cable bolt performance including in order of sensitivity: embedment length, water-to-cement ratio of the grout, type of grout and borehole diameter.