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A new testing method for indirect determination of the Unconfined Compressive Strength of the rocks: Core Strangle Test (CST)

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In this study a new testing method for indirect determination of Unconfined Compressive Strength (UCS) of the rock core samples is presented. As known, there are some methods for indirect estimation of UCS such as; point load (Is), Schmidt hammer, sonic velocity, block punch strength test etc. However point load testing method is widely used to estimate the UCS, there are many problems and limitations related to this method as reported in the recent literature. It was obtained that CST proposed in this paper namely "Core Strangle Test (CST)" had minimized some of the deficiencies, limitations etc. The principle of this test depends on the "strangle" type of loading a core along a circle perpendicular to the core axis. In the first stage of the studies, blocks of different type of rocks having the strength in a range from weak to strong were collected and cored for UCS, Point Load and CST tests. These tests were then conducted and relationships between UCS with Is(50) and CST were empirically explained and discussed in a point of the view of the usefulness of the method developed. From the finite difference modeling, analysis of numerical models reveals that the failure initiates at the surface of the specimen along the circumference plane and in subsequent loading stages failure grows toward the center from the surface of the specimen.

In CST, the effect of the heterogeneity or anisotropy was considerably minimized by loading rock samples through a line instead of a point. It was found that almost the same empirical equations can be used for different types of the rocks. It was also experimentally obtained that in the estimation of UCS, CST will be more preferable than point load index test. Because, CST tests led to considerably lower errors in determining the strength when compared with the results obtained from point load tests. Test results conducted on different core length showed that the CST can be repeated on the same rock samples. CST can be performed with portable equipment in the laboratory. If the portable facility for rock coring is available, CST can also be conducted in the field.

Key-words: Unconfined compressive strength; point load test; rocks; core strangle test.