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Title: Estimating the Uniaxial Compressive Strength of Argillites using Brazilian Tensile Strength, Ultrasonic Wave Velocities, and Elastic Properties.

Abstract: The uniaxial compressive strength (UCS) and tensile strength of rocks are key rock mechanical properties for any engineering project. The direct measurement of UCS can be time-consuming, expensive and impossible, especially for rocks that have well developed foliation and those that are highly fractured. Therefore, the need to use other mechanical properties, such as tensile strength, velocities, and elastic properties to estimate the UCS. This study focuses on the UCS and tensile strength of argillites, as these rocks are good sites for waste repository, are unconventional reservoirs, and are often used for aggregates in the construction industry. UCS, tensile strength, P- and S-wave velocities, and static and dynamic Young's moduli and Poisson's ratio measurements were conducted on argillites from within the late Cretaceous Naparima Hill Formation, Trinidad. The strength data show that the argillites range from weak to very hard rock, as the UCS and tensile strength varies from 44 to 210 MPa and 9 to 36 MPa, respectively. A power law correlation, with a regression coefficient (R2) of 0.87, was established between the UCS and tensile strength. Linear correlations, with R2 greater than 0.85, were established between UCS and velocities, and UCS and elastic properties. This clearly indicates that the tensile strength, P- and S-wave velocities, and static and dynamic Young's moduli and Poisson's ratio of argillites can be used to predict the UCS. Strength parameters can be influenced by rock properties including mineral composition, porosity and density. We therefore examined the influence of these rock properties and found that the strength of the argillites is mainly controlled by the porosity and carbonate cementation.

Keywords: Uniaxial Compressive Strength; Brazilian Tensile Strength; P-wave and S-wave velocities; Elastic properties; Argillites.