

12.16: The Effects of Stress and Lithology on Mudrock Mechanical Behavior

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ABSTRACT

Lithology and stress level control the variation in mudrock mechanical properties. A laboratory test program consisting of Constant Rate of Strain (CRS) compression tests and undrained triaxial shear tests quantify the sensitivity of mudrock compressibility, lateral stress ratio, and friction angle to changes in stress level and lithology. Mixtures were created using controlled mass fractions of Gulf of Mexico- Eugene Island clay and Min-U-Sil quartz silt. Material properties are observed to vary systematically with clay content (Fig 1). The results do not support the concept of a clay support vs grain support behavior. Dilative behavior at low stresses in low clay content mudrocks leads to increased strength. Increases in stress suppress the dilative behavior. Unique relationships between the lateral stress ratio and normalized shear stress (Fig 2), as well as the lateral stress ratio and friction angle are presented for mudrocks with a minimum clay content of 30% clay by mass.

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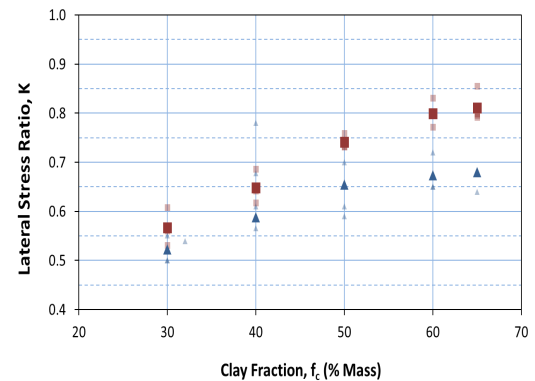


Fig 1: Lateral stress ratio by clay fraction at two confining stresses, 1 MPa and 10 MPa.

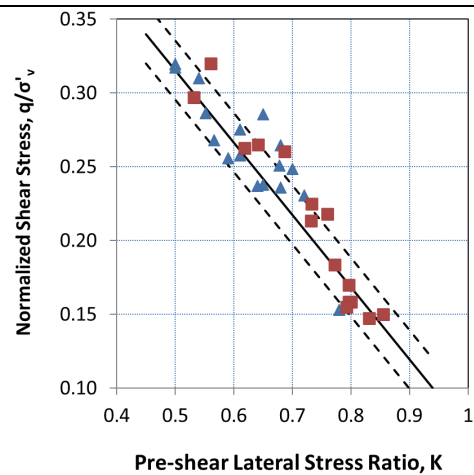


Fig 2: Normalized Shear Stress by Lateral Stress Ratio for minimum 30% clay specimens.

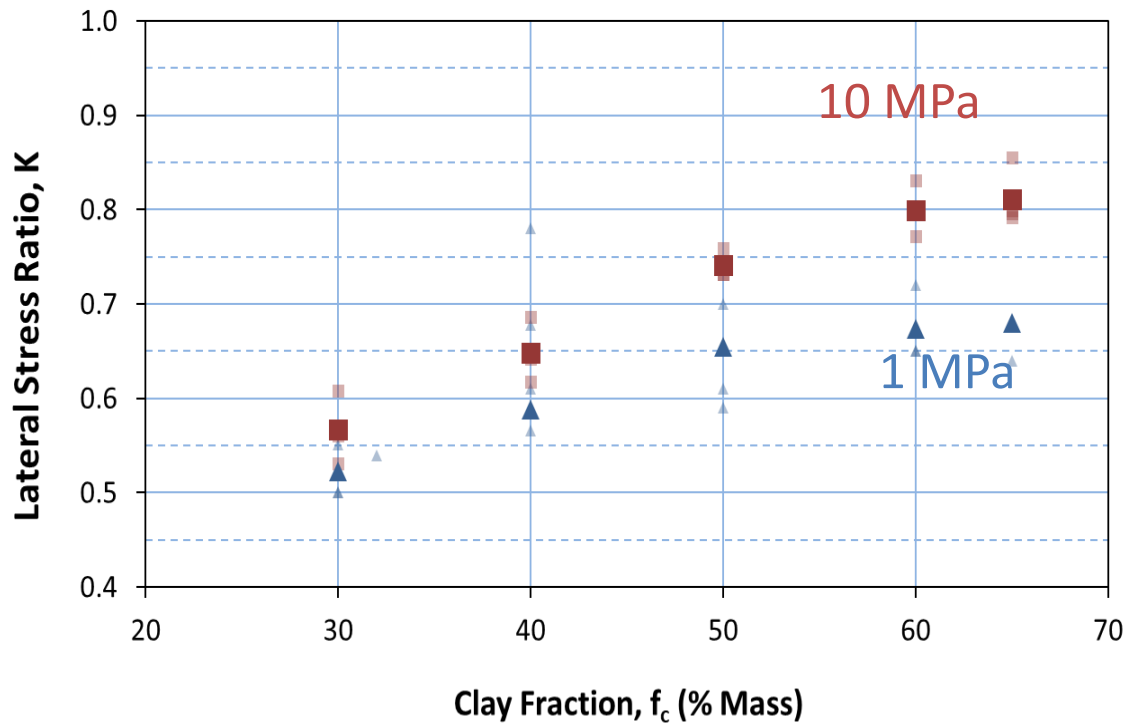


Figure 1: Lateral stress ratio by clay fraction at two confining stresses 1 MPa and 10 MPa, for specimens with clay content ranging between 30-65% clay by mass.

[Back](#)

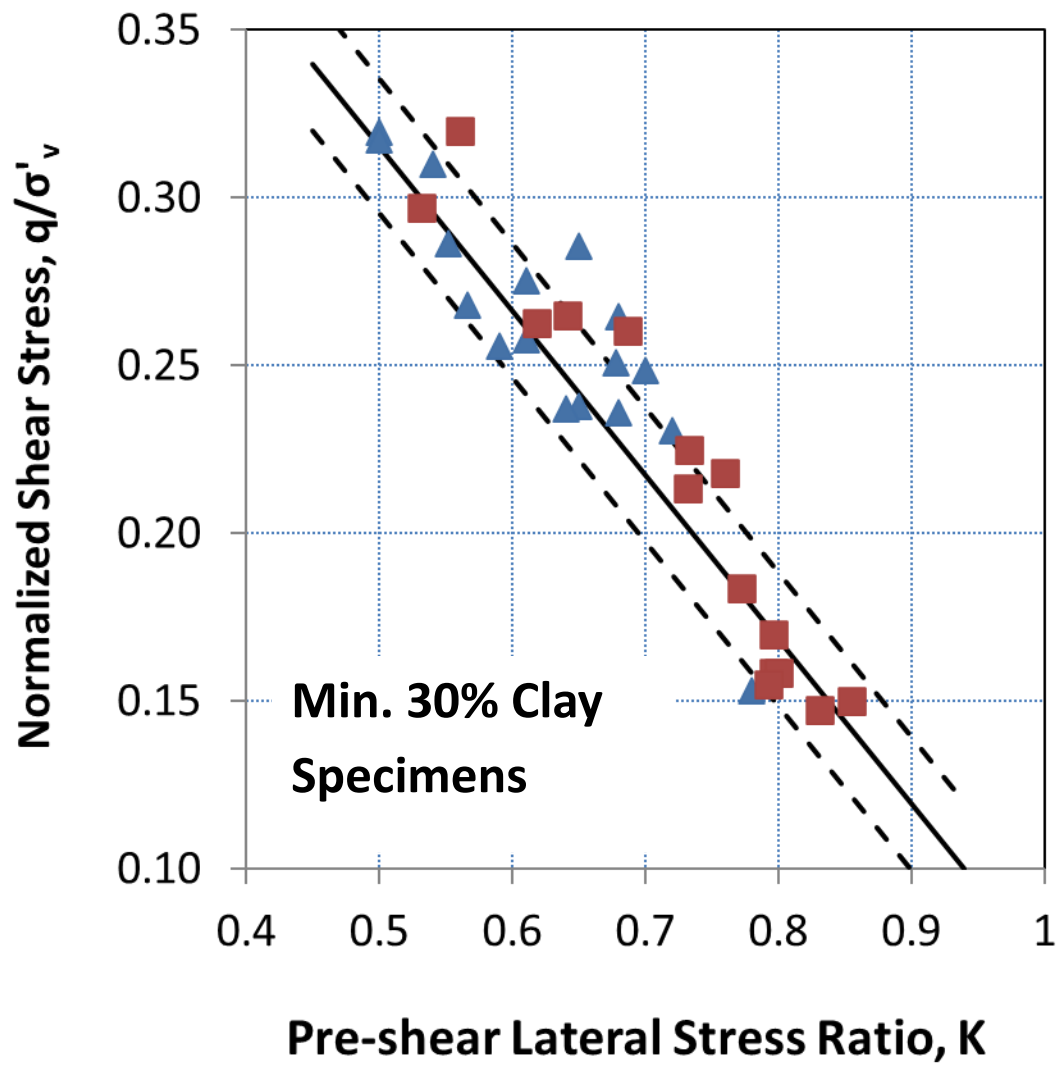


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[Back](#)