

12.15: Characterizing the Yield Surface of Gulf of Mexico Mudrock

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ABSTRACT

Testing is undertaken on a high pressure triaxial cell in order to map the yield surface of a Gulf of Mexico mudrock at high stress. There is limited test data at stresses approaching 100 MPa, especially in triaxial extension. Filling this gap will enable better comparisons of fundamental soil behaviour across orders of stress magnitude.

Undrained triaxial testing has been used in this research as it has been found to be a much more efficient way of mapping a mudrock's yield surface than compared to drained testing. There is also the advantage of eliminating uncertainty in defining a yield point when interpreting drained test data.

Results from testing at high stress show that triaxial extension results in similar critical state shear stress when compared to triaxial compression, however there is more strain to failure causing a more ductile material response. Tests where the material has been initially run in triaxial extension and then subsequently compression, allow insights into the behaviour as stress paths travel across the material yield surface. Results indicate that shear induce pore pressure is generated whilst moving inside the yield surface, highlighting the lack of an elastic response and a deviation from traditional elasto-plastic theory for soil behaviour.

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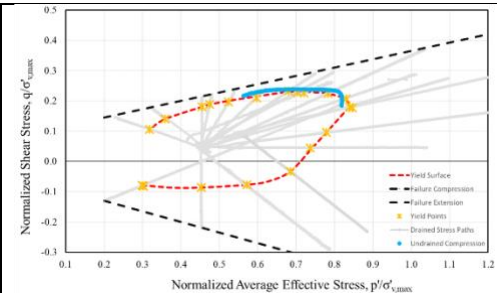


Fig 1: Drained effective stress paths for RGOM-EI mudrock consolidated to 1 MPa and sheared from OCR = 2. The undrained compression stress path in blue maps the interpreted yield surface well to a first order



Fig 2: High pressure triaxial cell

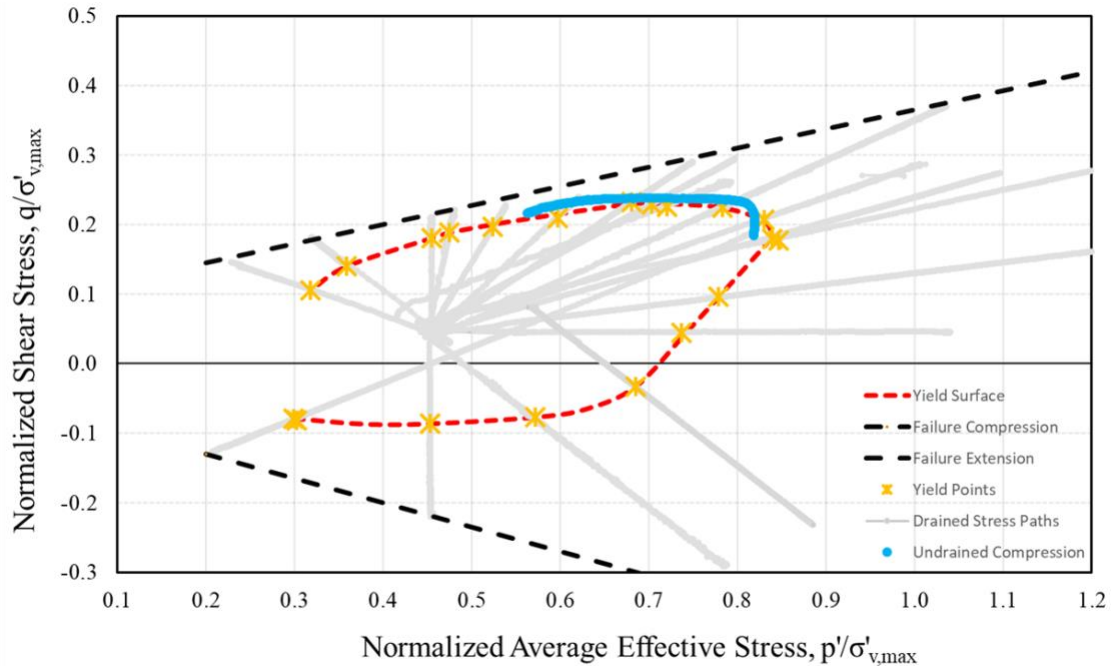


Fig. 1: Drained effective stress paths for RGoM-EI mudrock consolidated to 1 MPa and sheared from OCR = 2. The undrained compression stress path in blue maps the interpreted yield surface well to a first order

[Back](#)



Fig. 2: High pressure triaxial cell - capable of withstanding up to 100 MPa cell pressure

[Back](#)