

Geotechnical approach for determining in situ rock strength 1

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In order to plan a riser drilling operation, it is important to evaluate in situ formation strength for setting a Blow-Out Preventer (BOP), riser pipes and casings since the structure for riser drilling is basically supported by formation shear strength. Therefore, geotechnical tests for core sample (e.g., triaxial compressive test and constant rate of strain consolidation test) are essential approach for the evaluation. Since there are some methods of triaxial compressive test, it is also important to understand what kind of method is better for the formation strength evaluation.

Strain rate of muddy formation deformation around a conductor pipe during a riser drilling is quite high. Therefore, the deformation is progressed under undrained condition due to low permeability of muddy formation. Based on the assumption, triaxial compressive test under undrained-consolidation condition is the most suitable for formation strength evaluation. There are three types of triaxial compressive tests under undrained condition, unconsolidated-undrained (UU), consolidated-undrained (CU) and consolidated-undrained with pore pressure measurement (CUB). In general, the CUB test is better for in situ formation strength evaluation (e.g., Mochida et al., 2011). In some cases, CUB test result should be compared with other types of the undrained triaxial compressive test and the CUB test is a good reference for such comparison.

For a triaxial compressive test to evaluate in situ formation strength, cores taken at depths to evaluate it are required. Shallow core taken by gravity piston corer is also applied for the evaluation if normal consolidation is assumed. However, if over consolidation and/or geological deformation of formation is expected, the shallow core is not suitable for the in situ formation strength evaluation.

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