alliance
geotechnical & environmental solutions

# Rock Test Capability | Specialty Testing

# Compression Strength and Deformability

**Uniaxial Compressive Strength (UCS) and deformability are important mechanical properties of rocks widely used in different engineering related projects to evaluate the stability of rock structures against loads.**

The multi-range loading capacity of the Alliance's rock compression machine guarantees the high accuracy of load measurement. Our axial and circumferential extensometers are used to capture the rock deformation during loading and this data helps to determine the key rock deformability characteristics, e.g., Young's modulus, Poisson's ratio, etc. Customers can choose their preferred testing method and data interpretation methods given by ASTM, Australian Standards, ISRM, and TfNSW methods, or customised procedures.

## Compression Strength & Deformability Tests

### Unaxial Compressive Strength

- AS4133.4.2.1 | UCS of 50 MPa and greater
- AS4133.4.2.2 | UCS less than 50 MPa
- TfNSW T229 | UCS up to 50 MPa
- ASTM D7012 (Method C) | UCS

### Deformability

- AS4133.4.3.1 | Deformability of UCS greater than 50 MPa
- AS4133.4.3.2 | Deformability of UCS less than 50 MPa
- ASTM D7012 (Method D) | UCS + Elastic Modulus

# Indirect Tensile Strength Test

**Being a brittle material, rocks may exhibit very different behaviours under tensile and compressive loading. The tensile strength of rock can be orders of magnitude less than its compressive strength, therefore it is critical to precisely determine the rock's tensile strength in engineering practices such as tunnelling, underground mining and underground repositories.**

The Indirect Tensile Strength (ITS) test, or so-called Brazil splitting test, is a widely adopted test method that uses a rock compression machine to indirectly measure the rock's tensile strength. This test can be conducted as per standard methods given by ASTM, Australian Standards, ISRM and TfNSW test methods or we can customize these tests on the request by clients for specific design requirements or research projects.

## Tensile Strength Tests

- ASTM D3967 | Splitting Tensile Strength
- TfNSW T222 (Dried) | Indirect Tensile Strength of Drill Core
- TfNSW T222 (Saturated Surface) | Indirect Tensile Strength of Drill Core
- TfNSW T222 (Saturated Sulphate) | Indirect Tensile Strength of Drill Core

# Shear Strength Test

**The shear strength and the stress parameters (e.g., apparent cohesion and friction angle) of an intact rock or a rock with discontinuities are important designing parameters in geotechnical engineering. Those parameters are highly dependent on histories and stress conditions of each individual rock entities, such as its lithology, geological characteristics, and the stress conditions.**

The specialist laboratory in Alliance is accredited with ASTM D5607-16 (Performing laboratory direct shear strength tests of rock specimens under constant normal force). Following the method the laboratory can provide peak shear strength for intact rock samples, peak and residual shear strength for rock discontinuities, and sliding friction parameters (e.g., c and ϕ) from multistage tests. Depending on the requirements on specimen size, rock strength, stress conditions, etc., the laboratory uses a variety of shear/rock shear equipment to provide accurate tests with fast TATs.

## Shear Strength Tests

- ASTM D5607 | Rock Direct Shear Strength Tests of Rock Specimens Under Constant Normal Force
- ASTM D5607 | Shear on a rock with bedding
- ASTM D5607 | Shear on a rock with discontiunity

# Rock Swelling, Slake Durability and Other Tests

## AS4133.3.3
## Swelling Pressure Index

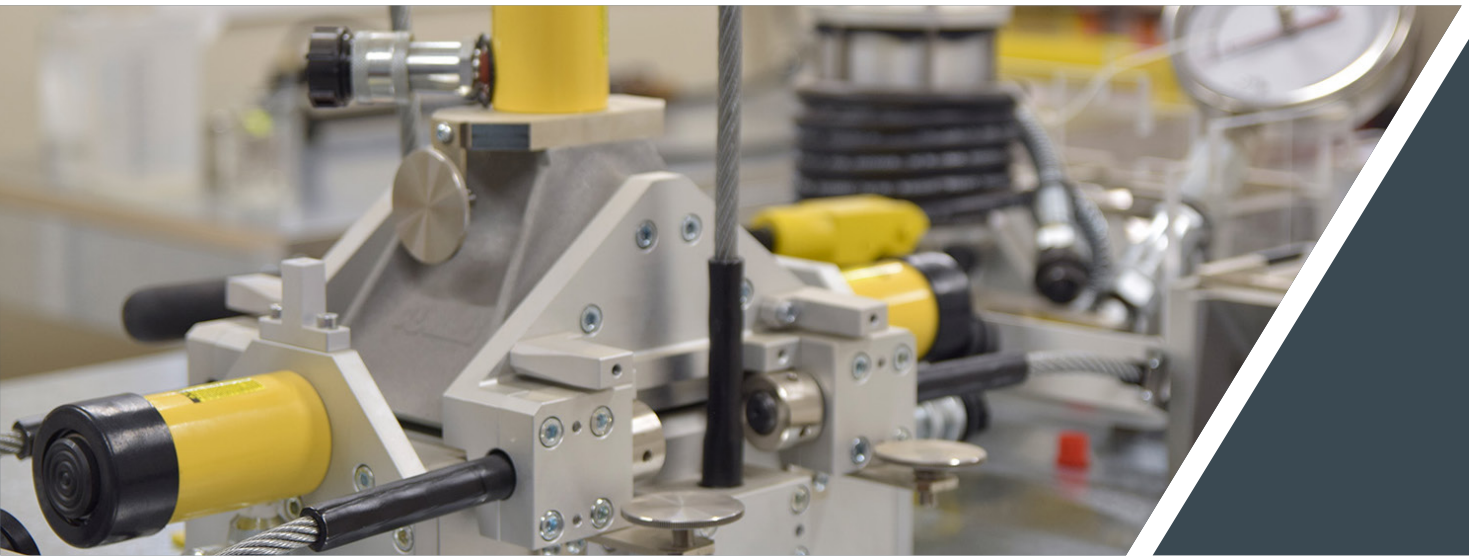
When inundated in the water the rock may exhibit swelling pressure at constant volume conditions. The swelling of the rock can lead to stability issues and is therefore important in many rock-related engineering practices. The specialist laboratory in Alliance is accredited with AS 4133.3.3 and uses the state-of-art automatic 1D consolidation-swelling test machine to accurately measure the swelling pressure of rock

## AS4133.3.4
## Rock Slake Durability

Under the effect of wet-drying cycles and physical abrasions, rocks tend to be weakened and disintegrated. Slake durability index is often used as an indicator of the rock's resistance to such conditions in a controlled chemical environment.

## Other General Test

Alliance also provides NATA accredited rock tests such as ***rock moisture*** (AS 4133.1.1.1), ***rock porosity and dry density*** (AS 4133.2.1.1), and ***point load strength*** (AS 4133.4.1 or TfNSW T223), etc. Other associated tests include but not limited to ***Cerchar abrasivity index***, ***Goodrich drillability and wear number, petrographic analysis, XRD analysis, aggressivity suite (APHA)*** and ***rock acid sulphate assessment (SCPOCAS + SCr),*** etc.



## Ian Goldschmidt

*Soil & Rock Mechanics Department Manager*

Ian (Goldy) Goldschmidt is the Department Manager of our specialty geomechanical testing section responsible for client management, strategic development, and innovation. Ian has been a NATA Technical Assessor in Geotechnical and Civil Construction Materials Testing since 1996 for Soil & Rock Mechanics. Ian has over thirty years of experience in the civil, geotechnical, environmental & mining industries in Australia & Internationally.

## Dr. Bowei Yu

*Soil & Rock Technical Manager*

Dr. Bowei Yu is our Technical Manager responsible for staff training, testing innovation and development. He has solid research and development backgrounds in soil mechanics, unsaturated soil mechanics, clay liners, contaminated investigations and remediations with over 7 years experience in geotechnical and geoenvironmental specialist testings. His research outcomes include 10 published technical papers and many global conference presentations.

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