

EQUOtip 3- Non-Destructive Test for Rock UCS



Introduction

The Equotip 3 provides the user with a highly portable, accurate tool to test hardness. The instantaneous results can be stored and saved on the indicating device. Whilst designed and used to determine the hardness of metal a new application in determining the UCS and logging rock core sample has been researched.

Van der Waal and Mulder found:

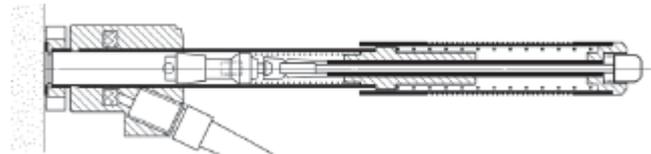
“The Equotip seems to be a convenient portable tool for estimating the UCS of rock material. The possibility to make diametral measurements on rock cores makes the Equotip very useful for core logging”

Hack goes on to say “the battery operated Equotip can be used in the field or laboratory at any angle and is very easy to use”. Further research in Australia by both tertiary institutions and commercially have reinforced these initial findings.

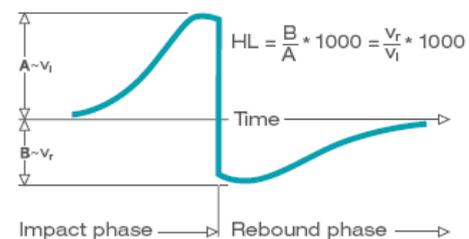
Equipment

The Equotip consists on the Impact device and the control/logging box. Seen below the impact device consists of a 3mm dia. Spherical shaped tungsten carbide test tip which is

spring mounted in an impact body. The test tip impacts on the test surface under spring force from which it rebounds.



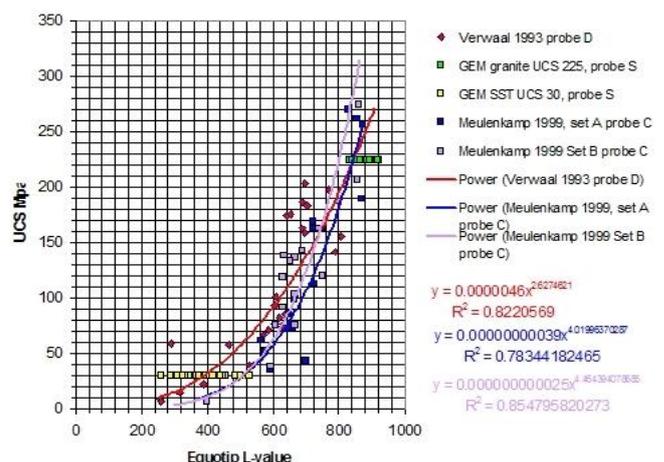
The velocity that the impact body is impelled and rebounds with is measured by the passing of a permanent magnet through a coil of wire. This induces a voltage proportional to the devices velocity.



The LEEB hardness value is the quotient of the impelled velocity over the rebound velocity multiplied by 1000. Harder materials will rebound the impact device giving higher LEEB hardness values.

Research has found that this correlates very well with UCS values found for rock cores.

Sample Test data





Perth
West Perth
0408 034 668

Brisbane
Toowong
0419 477 715

Melbourne
Niddrie
0428 315 502

Sydney
Belrose
0418 381 709

www.pcte.com.au

Equotip 3 vs Equotip 2

The introduction of the Equotip three has seen many improvements to the equipment

- Automatic correction for the orientation of the probe.
- A larger screen with backlight
- Choice to use internally rechargeable batteries or standard "C" Batteries
- Connection to PC using USB or Ethernet.
- New and Improved Equolink 3 software has also been introduced.

Ring Supports

Accurate testing using the Equotip 3 relies on the test specimen being immobilized. This can be achieved using a simple test jig firmly



connected to a heavy vibration resistant base. Furthermore the Support Ring (part 6) is designed to give a firm connection between the Impact Device and the core. The standard support ring is ideal for cores with radius greater than 60mm and flat surfaces. The Z14.5 to 30 support ring allows testing of cores between 29 and 60mm dia.

Impact Device Type S

The S type impact device uses highly durable material in the test tip in the impact body of the standard D type Impact Device. This improved durability is ideal for core logging because it prolongs the usage of the Impact Device between servicing.

References

1. Verwaal, W & Mulder, A 1993 'Estimating Rock Strength with the Equotip Hardness Tester', *International Journal of Rock Mechanics, Mineral Science and Geomechanics*, vol. 30, no. 6, pp. 659-62.
2. Hack, R, Hingira, J & Verwaal, W 1993 'Determination of Discontinuity Wall Strength by Equotip and Ball Rebound Tests', *International Journal of Rock Mechanics, Mineral Science and Geomechanics*, vol. 30, no. 2, pp. 151-5.
3. Hack, R & Huisman, M 2002 'Estimating the Intact Rock Strength of a Rock Mass by Simple Means', *Proceedings of 9th Congress of the International Association for Engineering Geology and the Environment*, Durban SA, pp. 1971-7.
4. Meulenkamp, F & Grima, M 1999 'Application of neural networks for the prediction of the unconfined compressive strength (UCS) from Equotip hardness', *International Journal of Rock Mechanics and Mining Sciences*, vol. 30, pp. 29-39.

About PCTE

PCTE have over 30years experience in the measurement and testing of concrete. With experience in research, consulting and construction they are able to assist you in reviewing the issues and developing solutions. PCTE can provide more than just the equipment. They can provide leading technical support for your business.

Other Equipment

PCTE has a diverse range of equipment available for insitu non destructive concrete measurement

- Schmidt rebound hammers
- Ultrasonic testing
- Electrical potentials and resistivity
- Permeability
- Absorption
- Ground Penetrating Radar
- Corrosion Monitoring
- Maturity