

ROCK MECHANICS LAB 3

DETERMINATION OF UNIAXIAL COMPRESSIVE STRENGTH OF CYLINDRICAL AND IRREGULAR ROCK SPECIMENS BY INDIRECT METHOD (POINT LOAD TEST)

1. Scope

This test measures the estimated uniaxial compressive strength of cylindrical rock specimens for strength classification and characterization of intact rock.

Point load test is another simple index test for rock material. It gives the standard point load index, $I_s(50)$, calculated from the point load at failure and the size of the specimen, and with size correction to an equivalent core diameter of 50 mm.

Point load test of rock cores can be conducted diametrically and axially. In diametrical test, rock core specimen of diameter D is loaded between the point load apparatus across its diameter. The length/diameter ratio for the diametrical test should be greater than 1.0

For axial test, rock core is cut to a height between $0.5 D$ to D and is loaded between the point load apparatus axially. Load at failure is recorded as P .

Uncorrected point load strength, I_s , is calculated as:

$$I_s = P / D_e^2$$

where D_e , the "equivalent core diameter", is given by:

$$D_e^2 = D^2 \text{ for diametrical test;}$$

$$= 4 A / \pi \text{ for axial, block and lump tests;}$$

$A = H D$ = minimum cross sectional area of a plane through the loading points.

The point load strength is corrected to the point load strength at equivalent core diameter of 50 mm. For $D_e \neq 50$ mm, the size correction factor is:

$$F = (D_e / 50)^{0.45}$$

The corrected point load strength index, $I_s(50)$ is calculated as:

$$I_s(50) = F I_s$$

2. Sample Preparation

Specimens do not need any special preparations. Ideally the specimen should be NX size and length of at least 1.5 times the diameter. Unlike the direct method, this test requires as many specimens as possible to determine a reasonable estimate.

3. Apparatus

A point load test equipment, with two hardened steel points, able to apply and measure an axial load to the specimen. The point load tester has sufficient capacity and capable to apply a load at a constant rate.

4. Procedure

- i. Ensure the point load tester's dial gauge is at zero.
- ii. Place the specimen at a point that is at least 70% of the specimen diameter from either ends of the core.
- iii. Load the specimen continuously at a constant rate until failure occurs.
- iv. Record the failure load. (P)
- v. Repeat (i) – (iv) for the remaining specimens.

5. Calculations

- i. The Point Load Index is computed as follows;
Point load Index, $I_s = P/D^2$

Where; P is failure load expressed as a force; D is the specimen diameter.

- ii. The Estimated Uniaxial Compressive Strength, therefore is computed as follows;
 - a. $\sigma_c = 241 I_s$