

Hard rock analysis: Strength determination using Point Load Index (PLI)

The Institute of Mining Engineering I provides analysis of rock samples for characteristic rock values by using modern laboratory equipment. This includes determination of strength and abrasiveness values of hard and soft rocks. In the laboratory area, the Institute of Mining Engineering I (BBK I) has set up a small workshop for rock testing. This workshop includes an area for processing of the specimen by rock saw and another room for analyzing and evaluating the rock samples. Furthermore, sampling of specimen on site can be provided.

General Information

The point load test is used to determine the point load index, an index value for rock strength. This index value is used for hard and soft rock characterization and classification. For this purpose a rock sample is loaded with a concentrated force introduced between two load application points until fracture occurs. The point load index i_s is calculated from the experimentally obtained fracture force F_B and the idealized fracture surface A of the rock sample:

$$i_s = \frac{F_B}{A}$$

The Point Load Test can be performed on regular and irregular shaped rock samples. Therefore, the point load test provides the opportunity to determine rock strength when drill cores for uniaxial compression tests cannot be obtained from disturbed, foliated or weathered rock. Drill samples and cuttings can also be used, as long as they are of sufficient size.



Specification

The test can be performed on cylindrical, rectangular or irregular specimen with dimensions between 10 and 120 mm. However, if possible the dimensions of the test specimen should not be less than 25 mm and not exceed 100 mm. Preparation of rock samples by sawing or drilling can also be offered by the Institute. Specimen size can be determined both before the experiment on the specimen or on the actual fracture surface after testing. Determination of the fracture force is based on a force-measuring device with digital display whose maximum load corresponds to 100 kN at an accuracy of 0.1%. Measurement of the load point distance of the specimen is achieved with a digital vernier caliper.

Uniaxial compressive strength:

The Point Load Test is used quite often to determine the uniaxial compressive strength of rocks. Conversion of the Point Load Strength (I_s), which has to be averaged over at least ten Point Load Indices (i_s) from the same rock sample, to uniaxial compressive strength (σ^*) is conducted by following formula:

$$\sigma^* = c * I_s$$

The rock-specific conversion factor c must be determined empirically, or is derived from comparative uniaxial compression tests.

Summary Point Load Test

Testing equipment:

- Maximum load: 100 kN
- Accuracy of the digital manometer: 0.1%

Hard rock specimen :

- Specimen size: up to 120 mm
- Shape: cylindrical, rectangular or irregular
- Number of rock specimen to determine the Point Load Strength I_s : 10