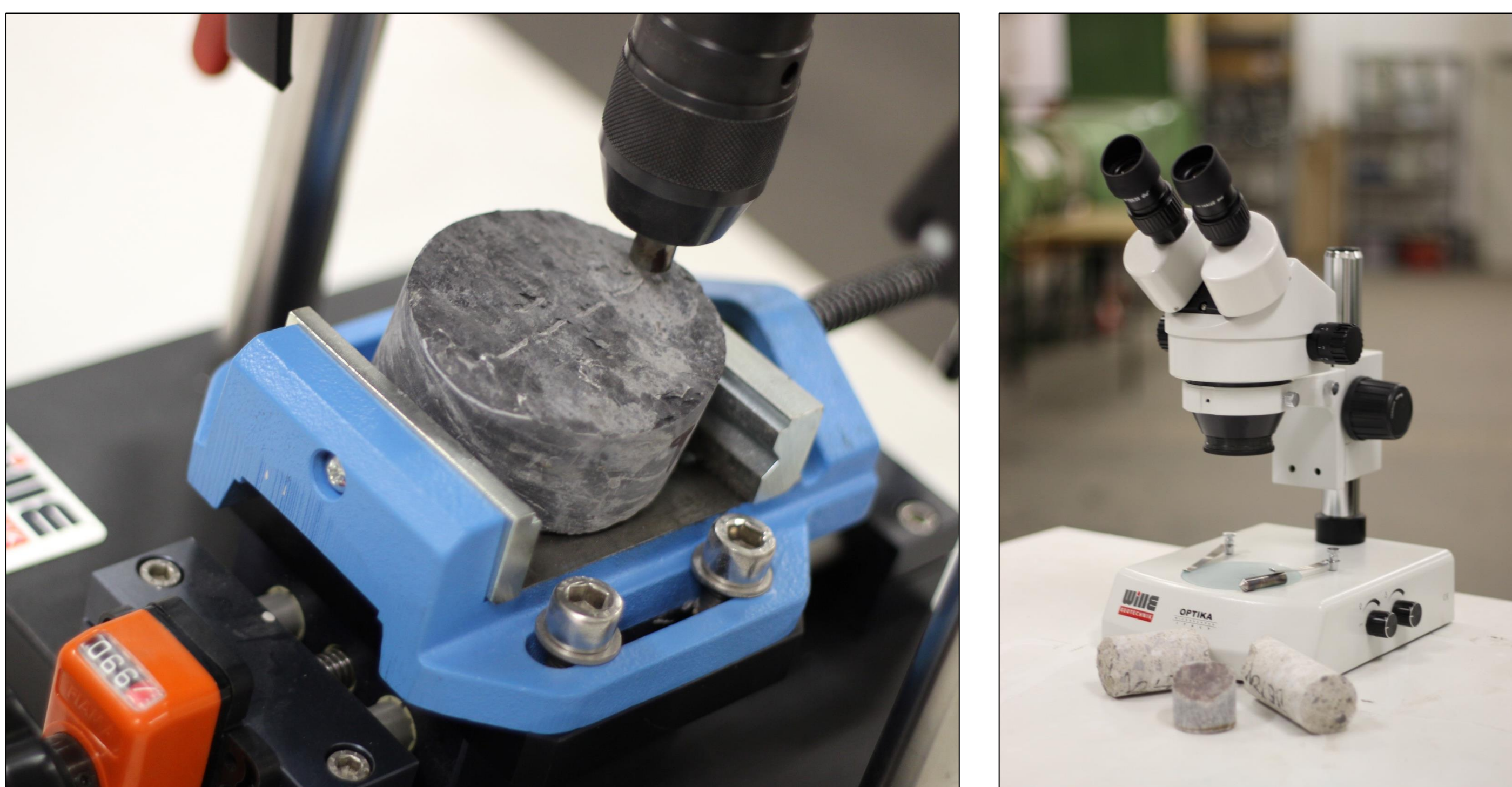


Hard rock analysis: Abrasivity determination using Cerchar Abrasivity Index (CAI)

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

Main use for the Cerchar Abrasivity Index (CAI) is the determination and classification of hard rock abrasiveness. Estimation of tool wear is a possible consequent application.



The Cerchar Abrasivity Test is one of the most used laboratory tests in regard to the abrasiveness of rock hard. The Cerchar Abrasivity Index value gained from this test is a standard value of hard rock classification.

The CAI is based on the wear of a hard metal test pin through the examined hard rock specimen. The test pin is pulled with constant pressure over a defined distance over the hard rock test specimen and the resulting CAI value is obtained from the width of the resulting frustoconical wear of the test pin.

Specification

The Cerchar Abrasivity Test is performed in a testing instrument according to "West" and the test pin is then examined under a microscope.

Each hard rock specimen is sampled with five test pins, with the CAI value resulting as the average of the five individual samples. The test pin with Rockwell hardness 54/56 is loaded with a force of 70 N and pulled within 10 seconds over a distance of 10 mm of the rough fracture surface of the specimen.

If specimen with a sawn surface are tested, the result is adjusted using an empirical conversion formula.

When evaluating the test pin wear under the microscope and thus determining the CAI value, each test pin is examined from four sides and the final result is averaged.

Summary Cerchar Abrasivity Test

Test pins:

- Rockwell hardness 54/56
- Load on testing instrument: 70 N

Hard rock specimen:

- Surface of rocks: rough fracture, when using a sawn surface an empirical conversion formula is used for adjustment
- Length of test section on specimen: 10 mm
- Quantity of testings' per specimen: 5

Analysis using a microscope:

- 120-fold magnification
- Reading of wear on testing pin from four sides

CAI	Abrasivity description	Examples
0,0-0,3	Not abrasive	Wood, peat
0,3-0,5	Hardly abrasive	Clay-siltstone
0,5-1,0	Slightly abrasive	Slate, marble (pure)
1,0-2,0	abrasive	Limestone, marble (containing SiO ₂)
2,0-4,0	Highly abrasive	Quartz sandstone, basalt
4,0-6,0	Extreme abrasive	Quartz, granite, gneiss