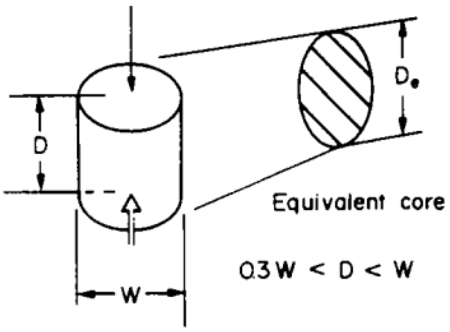
FREQUENTLY ASKED QUESTIONS – LOP PRACTITIONER'S GUIDELINES FOR SAMPLING AND LABORATORY TESTING FOR OPEN PIT OPERATIONS: ISRM R3 TO R6

Point Load Testing (PLT)

Can you provide guidance on the appropriate condition of an axial test specimen? For example, can axial tests be done on rough surfaces or can rock core be broken to the appropriate size with a rock hammer? Is it acceptable to do a diametral test in place of an axial test if no axial sized specimen is available?

Core specimens selected for axial testing should conform to ISRM (1985) and ASTM (2016) standards, including the following requirements:

- The specimen's diameter should be between 30 and 85 mm, with a preferred diameter of 50 mm (ASTM 2016).
- The specimen should have a length-to-diameter ratio between 0.3 and 1.0, as illustrated in the figure below (ISRM 1985; ASTM 2016).
- The surface of the specimen should be free from abrupt irregularities that can generate stress concentrations (ASTM 2016).



Source: ISRM 1985.
Specimen shape requirements for the axial test.

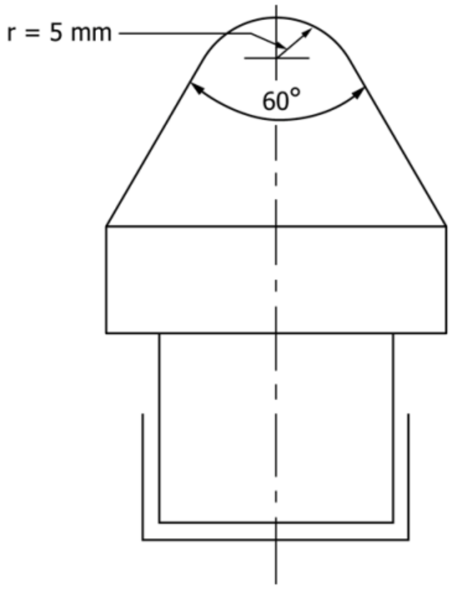
Both ISRM (1985) and ASTM (2016) standards specify that long pieces of core can be tested diametrally to produce suitable lengths for subsequent axial testing, provided that they are not weakened or damaged by the initial diametral test. Alternatively, suitable specimens for axial testing can be obtained by saw-cutting or core splitting (ISRM 1985; ASTM 2016). A rock hammer or chisel could also be used for this purpose, provided that the specimen is not weakened or damaged.

If there are no specimens available that meet the required dimensions for axial testing, diametral testing may be sufficient in the case of homogeneous rocks. However, for anisotropic rocks, both diametral and axial testing are required to establish the greatest and least strength values, which are in general obtained by testing parallel and normal to the planes of anisotropy (ISRM 1985; ASTM 2016). Therefore, for anisotropic rocks, every effort should be made to obtain suitable specimens for both diametral and axial testing by using the methods outlined above.

Are there any standards for when platens should be replaced?

The frequency of replacing the conical platens on a PLT apparatus depends on several factors, including the material of the platens, the frequency of use, and the type of rock being tested. Both the ISRM (1985) and ASTM (2016) standards require that the platens be made of hard materials such as tungsten carbide or hardened steel, which are designed to withstand repeated testing without significant wear.

However, it is essential to regularly inspect the platens for any signs of wear or damage over time, which could affect the accuracy of the results. As outlined in the ISRM (1985) and ASTM (2016) standards and illustrated in the figure below, the platens should have a truncated conical shape with a 60° cone and a 5 mm radius spherical tip. If the geometry of the platens does not conform to these standards due to wear, such as flattening of the conical tips or surface damage, the platens should be replaced.



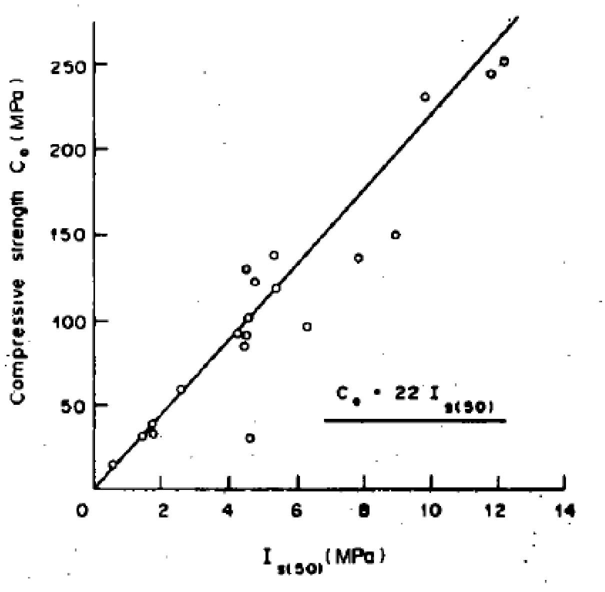
Source: ASTM 2016.
Schematic showing the required conical platen dimensions for point load apparatus.

Can you provide more detail on the K factor?

The K factor is a dimensionless linear factor used to convert point load index (I_{s50}) values to uniaxial compressive strength (UCS) using the following equation (ISRM 1985; ASTM 2016):

$$UCS = K \times I_{s50}$$

Correlations between I_{s50} and UCS must be established based on site-specific data, as illustrated in the example below, and the source of these correlations should be clearly documented when presenting PLT results as equivalent UCS. It is strongly recommended not to use K values published by others, including the generalized values found in the ISRM (1985) and ASTM (2016) standards, which are often not representative of site-specific conditions.



Source: ISRM 1985.
Example of correlation between point load and uniaxial compressive strength results.

The K value depends on several factors, including:

- **Rock type** (e.g., K is typically lower for weak rocks than strong rocks)
- **Weathering and alteration** (K tends to decrease with increasing degree of weathering or alteration)
- **Type of test** (e.g., for anisotropic rocks, different K factors are obtained for diametral and axial tests due to the different loading orientation relative to the anisotropy orientation)
- **Failure type** (e.g., different K factors are obtained for specimens that fail through the homogeneous rock matrix compared to specimens that fail along a discrete feature or a combination of both)

These aspects should be considered when establishing site-specific correlations between I_{s50} and UCS. For example, it would be suitable to compare laboratory UCS data to $I_{s(50)}$ values obtained from testing specimens from the same geotechnical domain, which failed through the same mechanism, for determining K for a specific rock unit from a specific project site.

References

ASTM. 2016. Standard Test Method for Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications, Designation D5731–16. ASTM International, West Conshohocken, PA, USA.

ISRM. 1985. Suggested Method for Determining Point Load Strength. International Journal of Rock Mechanics and Mining Sciences & Geomechanics Abstracts, 22(2):51–60.