Brazilian Test

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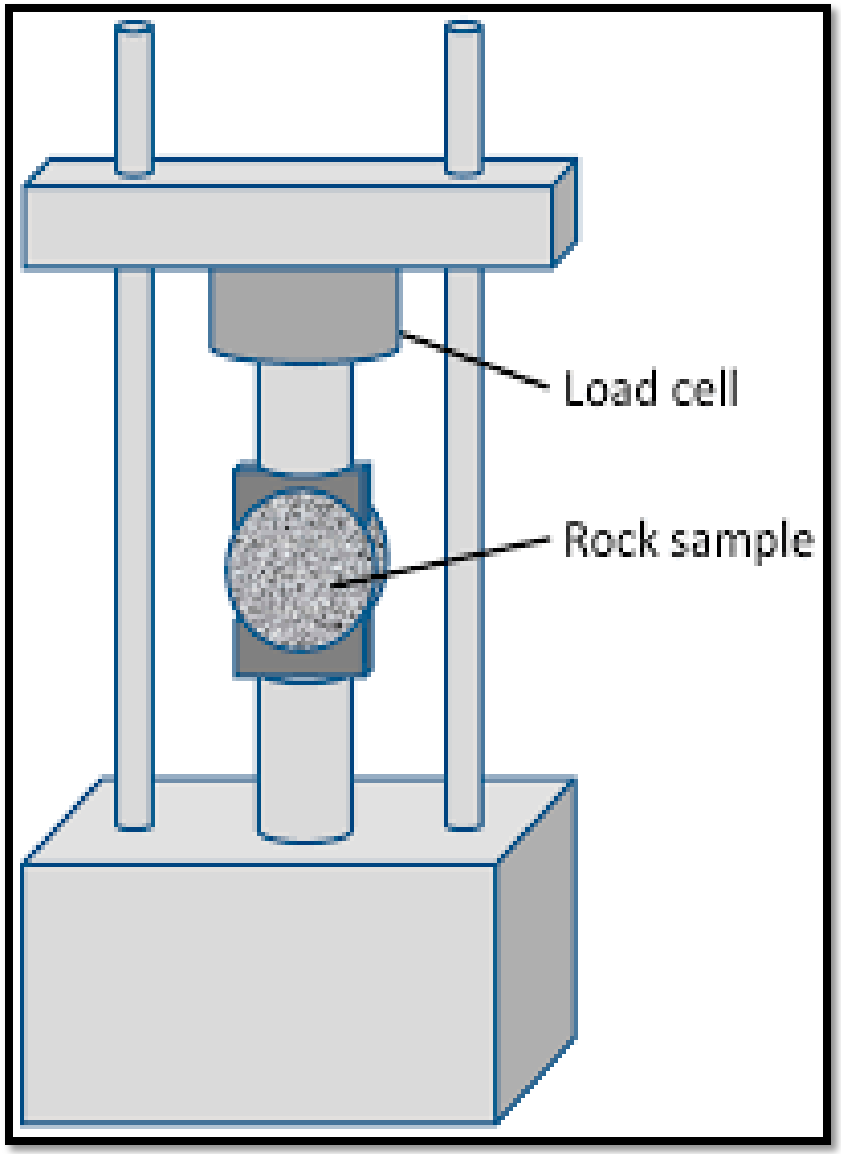
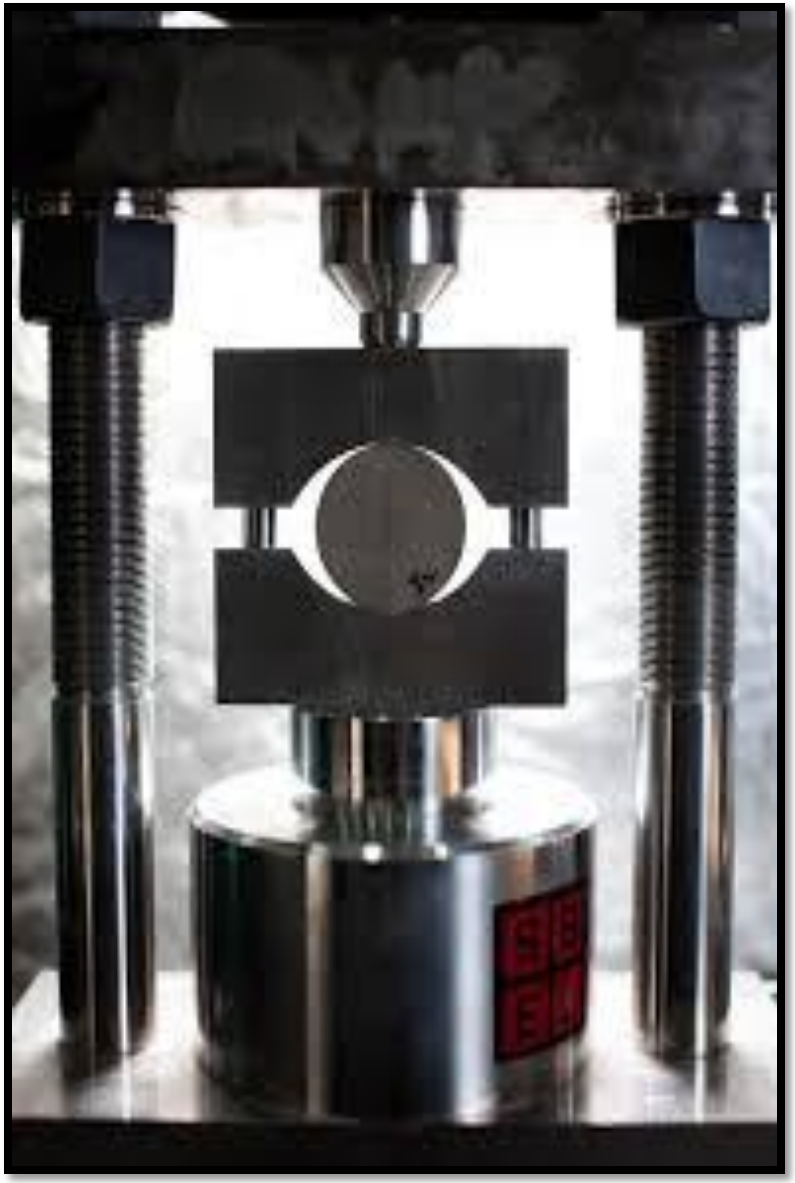
- Brazilian Test is a geotechnical laboratory test for indirect measurement of tensile strength of rocks.
- The test is appropriate for materials which are relatively weak in tension, such as ceramics.
- It is the commonly used testing method in geotechnical investigation in rocks due to its simplicity and efficiency .
- This test is sometimes used also for concrete.

- The method was first used in Brazil for testing concrete rollers on which an old church was being moved to a new site.

- This test is done by applying a load vertically at the highest point of a test cylinder or disk, which is itself supported on a horizontal plane.


Load cell
Rock sample



PROCEDURE

- In the Brazilian test, a disc shape specimen of the rock is loaded by two opposing normal strip loads at the disc periphery.
- The load is continuously increased at a constant rate until failure of the sample occurs within few minutes.
- At the failure, the tensile strength of the rock is calculated .

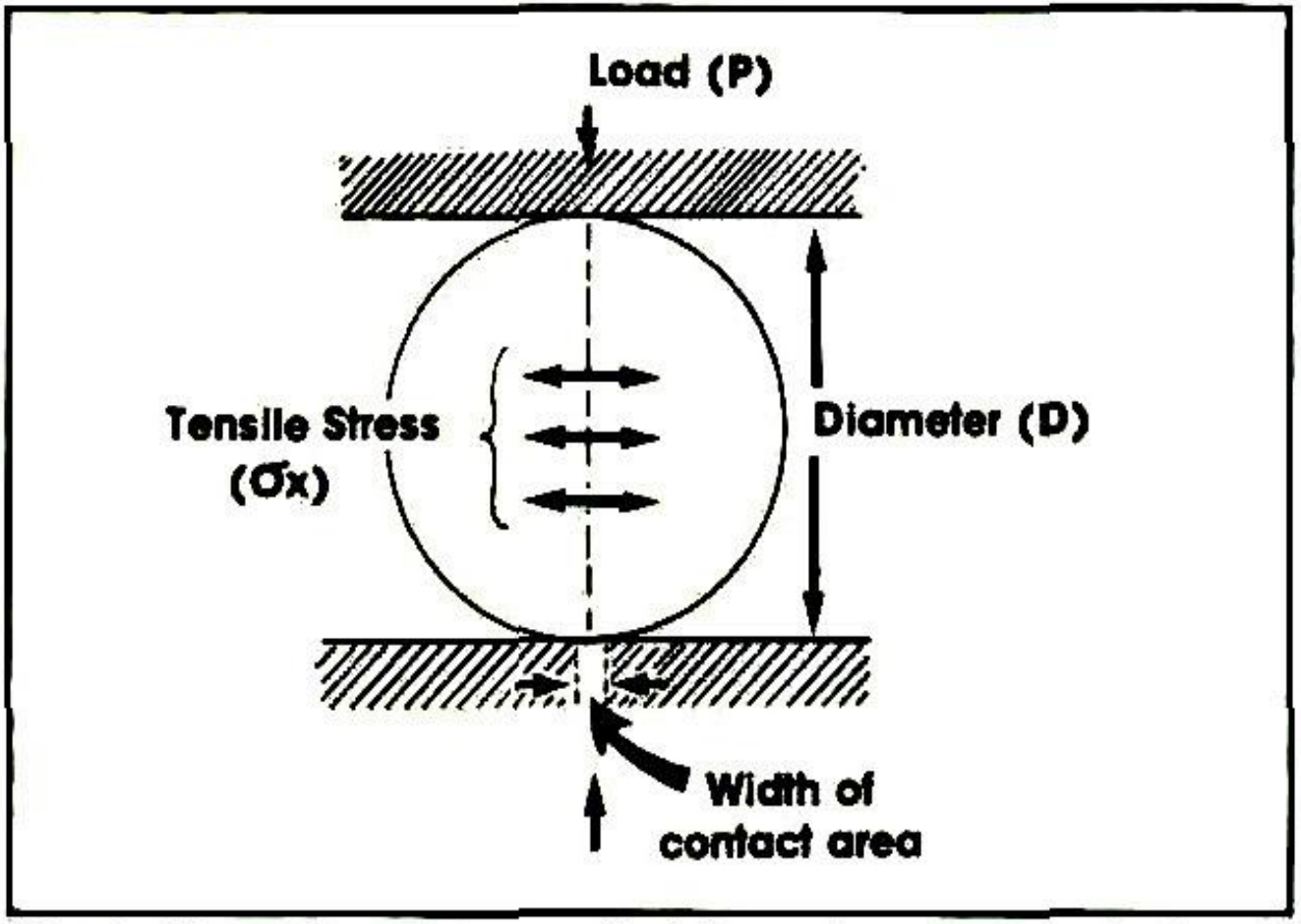
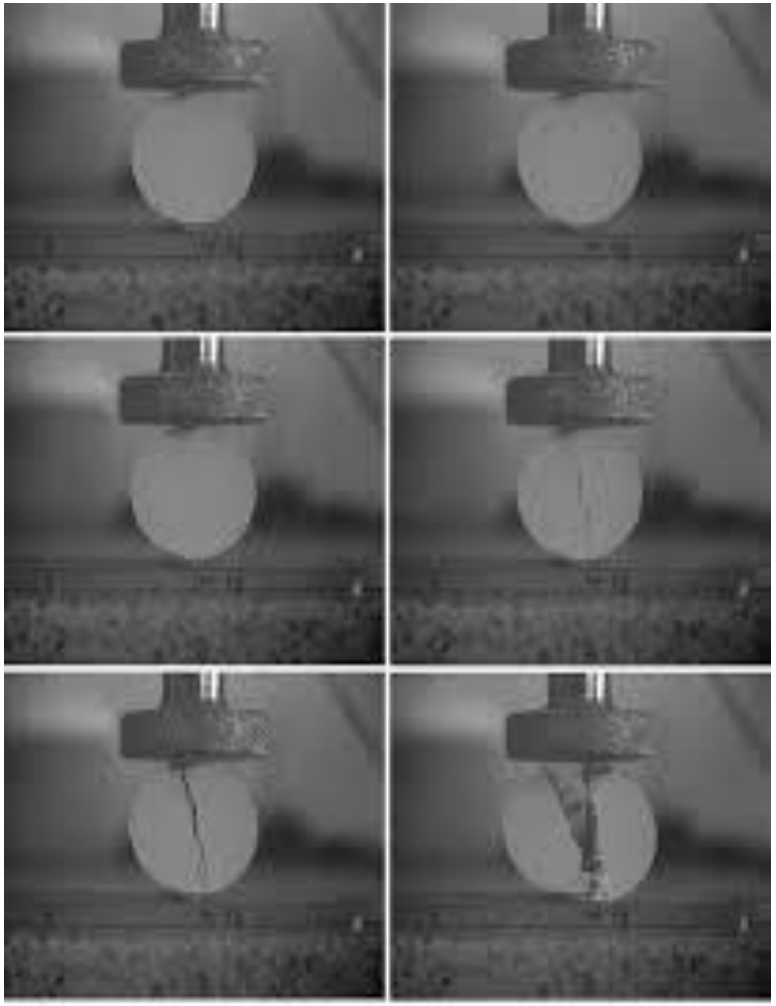
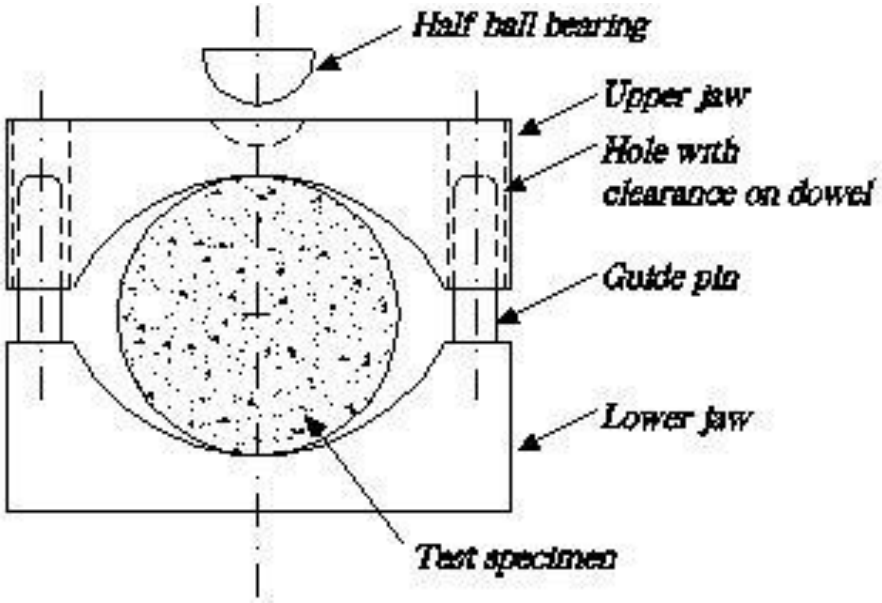


Fig. 3: Illustration of the tensile failure of brittle material in the Brazilian test.




Half ball bearing
Upper jaw
Hole with clearance on dowel
Guide pin
Lower jaw
Test specimen

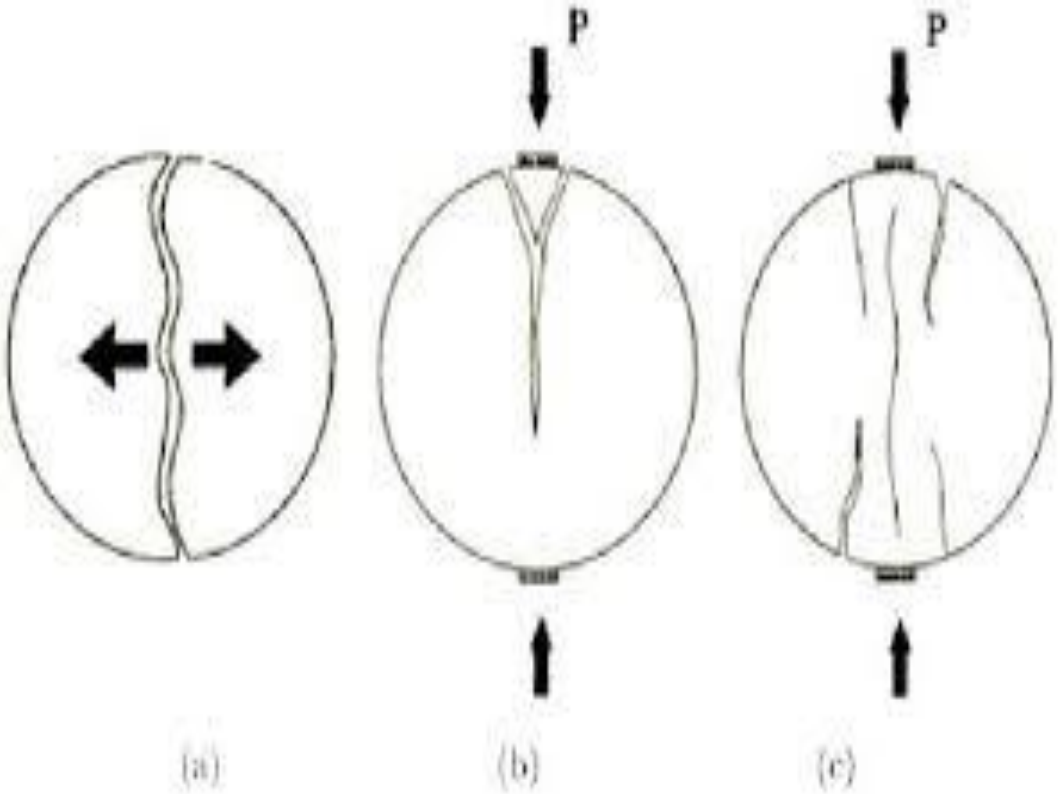
- Specimen thickness/diameter ratio should be 0.5 to 0.6 .
- The loading rate depending on the material and may from 10 to 50 KN/min.
- The maximum tensile stress occurs at the center of the disk in a direction perpendicular the loading axis
- The sides should be smooth and without roughness larger than 0.3 mm.

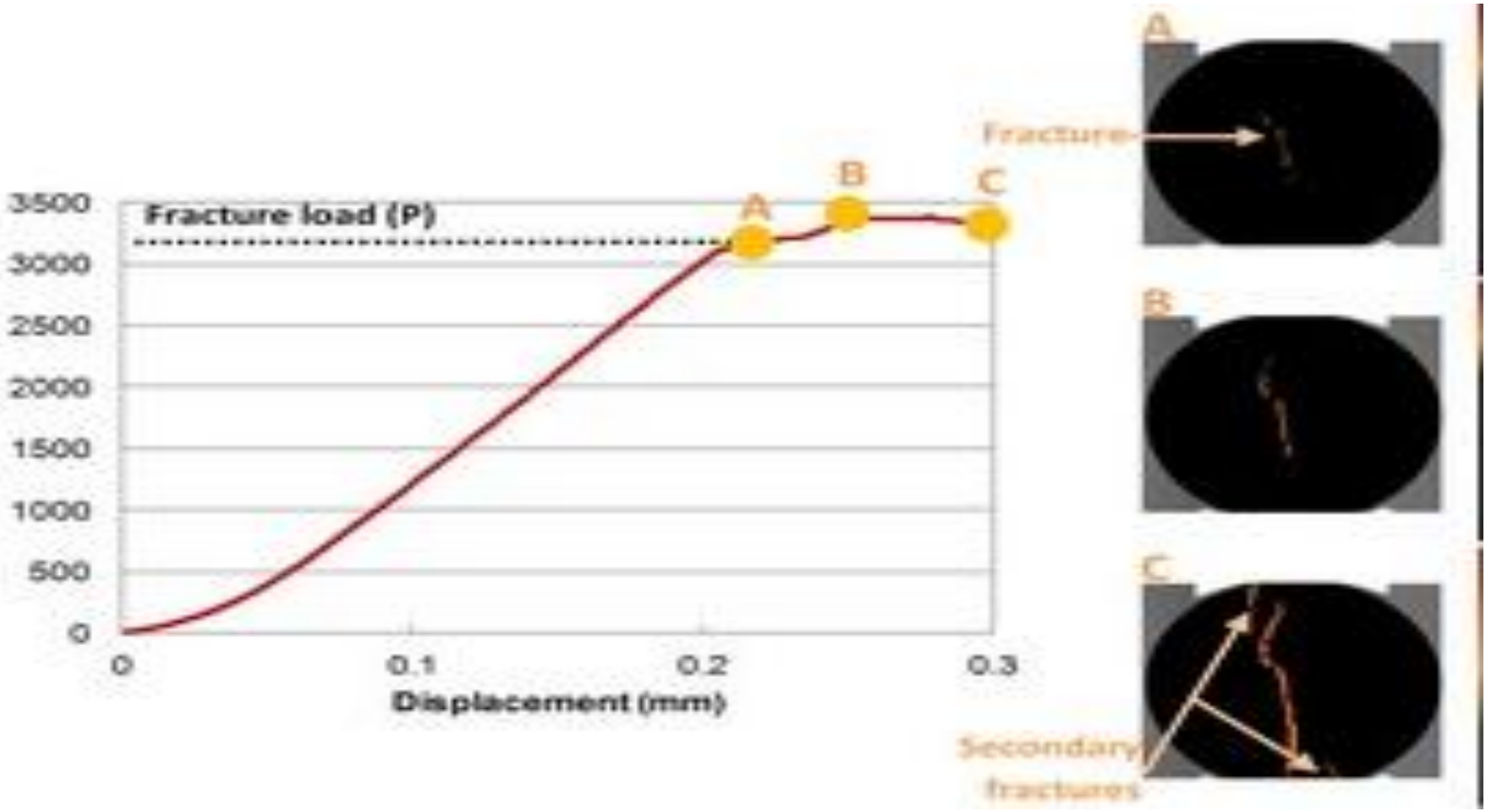
- Depending on the tensile strength of the material, fracture may initiate at the center leading to the propagation of a crack from the center outward .

- Accompanying tensile stress is a compressive stress in the direction of the loading axis

Failure modes in the Brazilian test

The nature of the principal failure mode changes from axial splitting to shearing along a single plane to multiple fracturing in the case of both granite and sandstone specimens as uniaxial compressive strength (UCS) increases





Load – displacement curve of Magnisa obtained during Brazilian test

the tensile strength of the rock is calculated as follows:

$$\sigma = 2P/(\pi DL)$$

P - applied load

D - diameter of the sample (D=2R)

L - thickness of the sample.

PARAMETERS AFFECTING ROCK STRENGTH

1- Rock grain size
2- Rock type and composition
3- Rock density and porosity
4- Rate of loading
5- Geometry, size and shape of the test specimens
6- Water pore pressure and saturation
7- Temperature