JCS → joint wall compressive strength.

measured. The basic friction angle of the rock material is 31° and the wall JCS strength is 40 MPa.
Calculate the force required to induce shear failure along the plane by means of the Mohr-Coulomb equation, if the different normal stresses of i) 10 kPa and ii) 10 MPa are to be applied.
Compare the above results with those obtained from the Barton & Chouby equation.

6. A force of 4 MN must be carried by a 0,5 m diameter pile founded on Class IV fair & blocky sandstone at a depth of 12 m below surface. Assume horizontal stress equals vertical stress and unit mass of rock is 2 600 kg/m³. UCS for sandstone is 60 MPa.

   Calculate the FOS against failure by means of the Hoek&Brown criterion and calculate the deformation (mm) if the rock mass modulus is 20 GPa. = 0.4 = 20 x 10³ MPa

4 x 10⁻⁴ m / ↳ 4mm

$\tau = \frac{F}{A}$

$F = \tau \times A$

Barton and Choubey (1977)

$$\tau = \sigma_n \tan\left[JRC \log_{10}\left(\frac{JCS}{\sigma_n}\right) + \phi_b\right]$$

Low $\sigma_n$ – roughness $i_2$
Med $\sigma_n$ – waviness $i_1$
High $\sigma_n$ – $\phi_b$

Modified Barton and Choubey

$$\tau = c_t + c_a + \sigma_n \tan\left[JRC.JMC \log_{10}\left(\frac{JCS}{\sigma_n}\right) + \phi_b + i_1\right]$$

where $c_t$ = true cohesion of infilling
$c_a$ = apparent cohesion by bridging
$i_1$ - waviness angle

Mohr-Coulomb

$$\tau = c + \sigma_n \tan(\phi) + i$$

Rock Mass permeability

$$K = \frac{g.e^3}{12\gamma b}$$

g - gravitational acceleration
e- joint separation
γ - viscosity of the fluid
b - joint spacing

$$K = ek_f + k_r$$

$k_f$ - permeability of the fill material
$k_r$ - permeability of the rock material

$$Q = kiA$$

Lugeon = water take per 1 m length of borehole at 1 bar pressure