Slope Stability

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Exercise 1

BLOCK STABILITY ANALYSIS

Assess the stability of the block ABCD in Fig. 1 considering the different proposed conditions. The block has a width of 1 meter. The characteristics of the slip surface AB and of the vertical joint BC are provided for each condition.

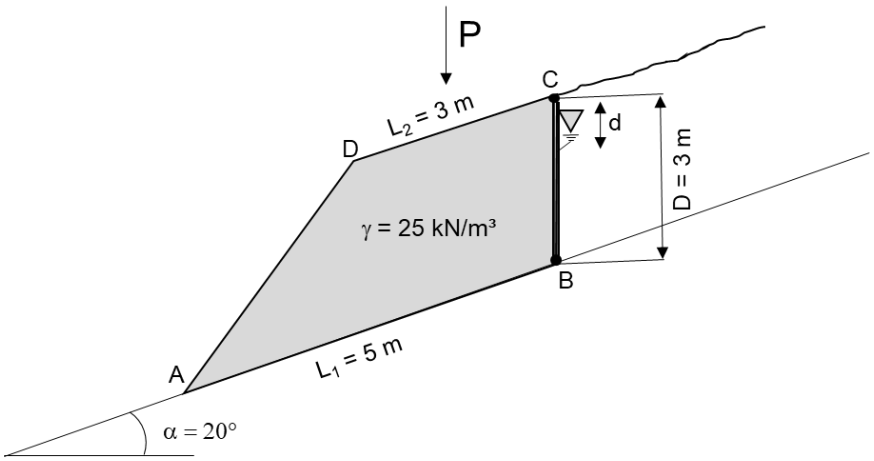

Fig. 1. Block geometry.

Absence of water in the vertical joint and slip surface

1. Compute *F* considering the following shear strength parameters:

    a. $c' = 0$, $\varphi' = 22°$;
    b. $c' = 10$ kPa, $\varphi' = 22°$;
    c. $c' = 0$, $\varphi' = 19°$;
    d. $c' = 10$ kPa, $\varphi' = 19°$.

    Discuss the contribution of the cohesion to the stability of the block.

2. For the cases 1.a and 1.b, assess the effects of an additional vertical load (*P*) on the block stability.
3. For the case 1.b, compute the maximum value of P for which $F \geq 1.3$.

Presence of water in the vertical joint and slip surface

4. Assuming $c' = 10$ kPa and $\varphi' = 22°$, plot *F* as a function of the water level depth *d* in the vertical joint and assess the minimum *d* for which $F \geq 1.3$, for the following cases:

    a. Drainage at the toe A is allowed;

    b. Drainage at the toe A is prevented.

    Discuss the effect of the drainage condition on the stability of the block.