Slope Stability

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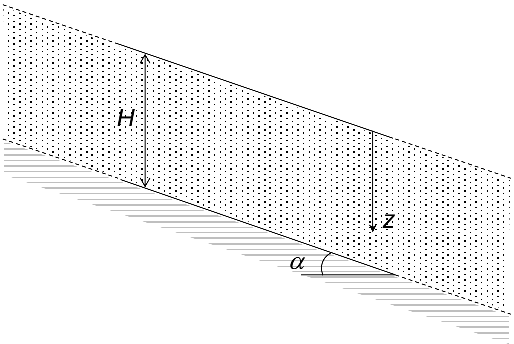
Exercise 2

INFINITE SLOPE ANALYSIS

Part 1

Assess the stability of the slope in the figure below considering the different proposed conditions. The following data are given in the corresponding table: saturated unit weight of the soil (γ_{sat}), saturated water content (w_{sat}), geometry of the slope (α and H) and shear strength parameters (φ' and c').



γ_{sat} (kN/m^3)	w_{sat} (-)	α (°)	H (m)	φ' (°)	c' (kPa)
21.0	0.235	35.0	3.0	25.0	10.0

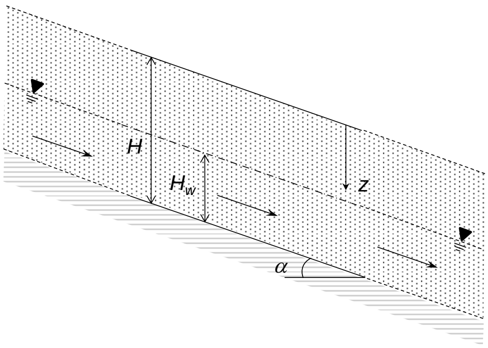
1. Compute the safety factor *F* at the depth z=H for the following conditions:
   a. dry soil deposit;
   b. submerged soil with a hydrostatic pore water pressure distribution;
   c. as case 1.b, with the additional application of a constant external vertical stress q = 20 kPa acting on the extrados of the slope.

2. For a flow parallel to the slope, compute *F* at $z = H$ using two alternative approaches to account for the water flow: (i) total weight of the soil and pore water pressure distributions along the sides of the soil slice, (ii) buoyant weight of the soil and seepage force.

3. Compute *F* at $z = H$ in the case of a vertical flow.

Part 2

The sand deposit in the figure below is characterized by a water flow parallel to the slope; the water table is below the ground level. The soil above the water table can be considered dry. The following data are given in the corresponding table: saturated unit weight of the soil (γ_{sat}), saturated water content (w_{sat}), geometry of the slope (α and H) and shear strength parameters (φ' and c').



γ_{sat} (kN/m^3)	w_{sat} (-)	α (°)	H (m)	φ' (°)	c' (kPa)
22.0	0.25	25.0	3.0	35.0	0

4. In order to design a possible intervention on the level of the water table, compute the maximum H_w to guarantee $F \geq 1.3$.