PROKON Support Portal

Perceived Difference In Hydrostatic pressures (Program vs. Conventional Calculation)

Andrew - 2019-03-04 - 0 Comments - in C14:Concrete retaining wall design

Why does the hydrostatic pressure in the Retaining Wall Design module differ from the conventional approach of calculating hydrostatic pressure ($\rho_w * H_w$)?

The conventional method of calculating the total pressure acting on the wall includes calculating:

1. The soil pressure above the water table,
2. The effective pressure of the soil below the water table,
3. The hydrostatic pressure.

The simplified method used in the Program calculates:

1. The dry soil pressure across the entire height of the soil (H1-H3); and
2. Calculates an 'effective' hydrostatic pressure. Instead of adjusting the soil pressure below the water table, the hydrostatic pressure is adjusted.

When comparing the program’s results with the results from conventional calculations, the results obtained in the Program will have a higher soil pressure (no buoyancy effect on the soil) and a lower hydrostatic pressure. When comparing the superimposed pressures in each case, the total pressures do correspond.
The above-mentioned is visually explained in the sketch below. For this example, the following values were assumed:

ρ_{soil} = 20 kN/m^3

ρ_{water} = 9.81 kN/m^3

K_a = 0.283

DRY SOIL

SUBMERGED SOIL

WATER

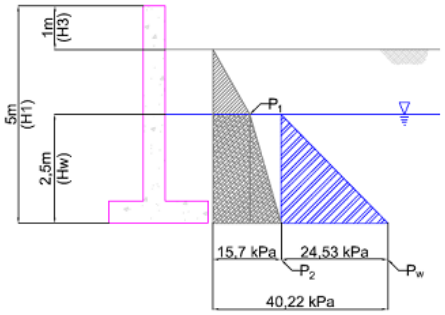
EXAMPLE:

ρ_{Soil} = 20 kN/m^3

ρ_{Water} = 9,81 kN/m^3

K_a = 0,283

Δ=0°

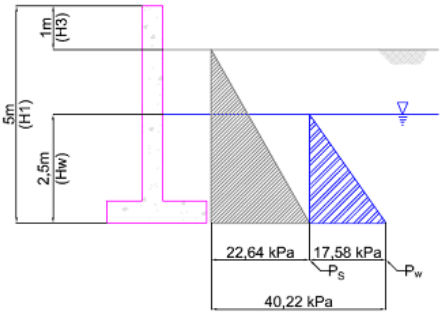


CONVENTIONAL METHOD

$P_1 = (H_1 - H_3 - H_w) * \rho_{Soil} * K_a$

$P_2 = P_1 + H_w * (\rho_{Soil} - \rho_{Water}) * K_a$

$P_w = H_w * \rho_{Water}$



SIMPLIFIED METHOD

$P_s = (H_1 - H_3) * \rho_{Soil} * K_a$

$P_w = H_w * \rho_{Water} * (1 - K_a)$