Optum Exercise - Civil 423: Exam 2023

This exercise has been developed as the annual design challenge of the swiss association of geotechnics.

1 Problem statement

The retaining wall made up of sheet piles (PU-8, the material is already coded for you and assigned) is located near a water basin. After excavating to a depth of 1.75 meters, KRUPP Gi-SV-380 struts (the material is already coded for you, you'll only need to assign it and check the geometric parameters of the problem) spaced 2.40 meters apart are installed and prestressed to a force of 11 kN. They have a stiffening function for the sheet pile wall and are pressed against a rigid, non-displaceable wall situated 3.50 meters away (their length is 3.50 m). The excavation is then continued to a final depth of 5 meters.

The load created by the water basin and the water can be considered uniformly distributed. The water basin is only filled once the final excavation has been completed and the weight of the construction is negligible.

The soil consists of a densely compacted, cohesionless sand which is also pre-set in the Optum template.

The groundwater level is located at a depth of 5.35 meters below the ground surface, as indicated in the sketch of figure 1.

For our analysis, we will perform an **elastoplastic calculation** to estimate the deformation at the top of the retaining wall and the forces in the strut.

2 Mesh creation

We have provided you with the mesh and a result point to track the deformation at the top of the wall. The initial stresses are already calculated.

3 Stages to be modeled

Model the excavation stages according to the instructions in the problem statement for an elastoplastic analysis. Remember to apply the pre-stress on the strut in a seperate stage, you need to apply the pre-stress only in this stage.

4 Results to report

Report the wall displacement at the ground level (+0.00 m in Figure 1) after the final excavation and the filling of the water basin.
Report the forces in the strut after the final excavation and the filling of the water basin.

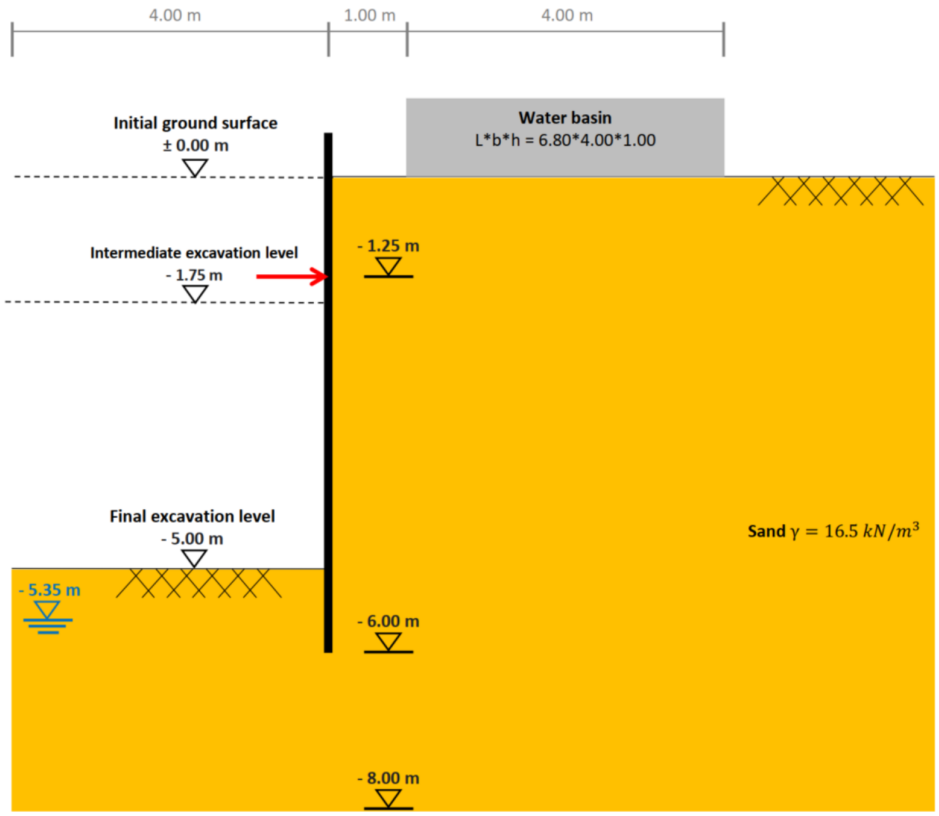

Figure 1: The geometry of the problem with the necessary information for the design and solution of the problem.