Example with a base slab and lining option #1

This document presents an example on the proper use of a the base slab feature. The lining feature creates a seal at the excavation level for ground water. As a result, if the uplift due to water is greater than the dead load, the vertical stresses will be negative and the excavation unstable. In this version, the software gives the possibility to include the base slab weight (support) in the stabilizing dead weight during analysis. This can be done by enabling the "Treat as base slab option" for the slab support. A critical limitation, is that the base slab base must be positioned on the excavation surface (however, the support reference elevation is at the middle of the slab height). Also, for this feature to work properly one should use a horizontal excavation.

Two main walls:	Xleft.wall = 0m Xright.wall = 10m
Wall depth:	15m
Wall section:	Diaphragm wall 60cm thick
Model limits:	Left -10, right +20, top +10, bottom -20
Slave walls:	Installed from top-down on both walls at 3m intervals
Wall section:	30cm thick
Soil:	Friction= 30 deg, γ_t= 20 kN/m^3, γ_d= 19 kN/m^3 total
1st stage exc:	-3m
3rd stage exc:	-9m
Final excavation:	-9m

Base model

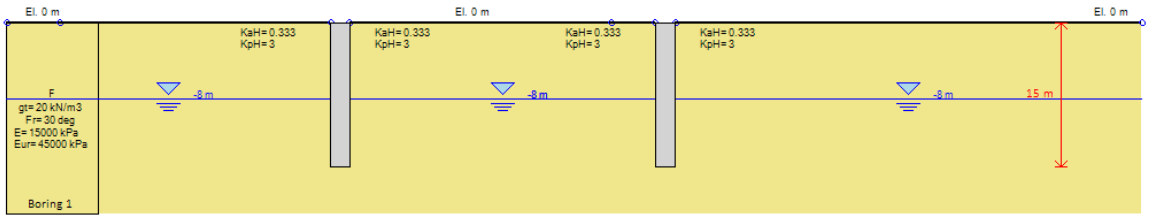


Figure 1: Model of the problem

From the General tab select Model Dim.-Limits to launch the dialog in Figure 2:

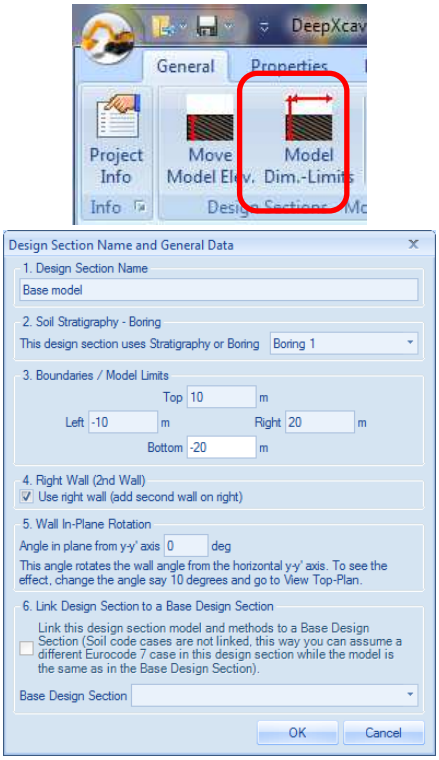


Figure 2: Set project limits (for viewing model better)

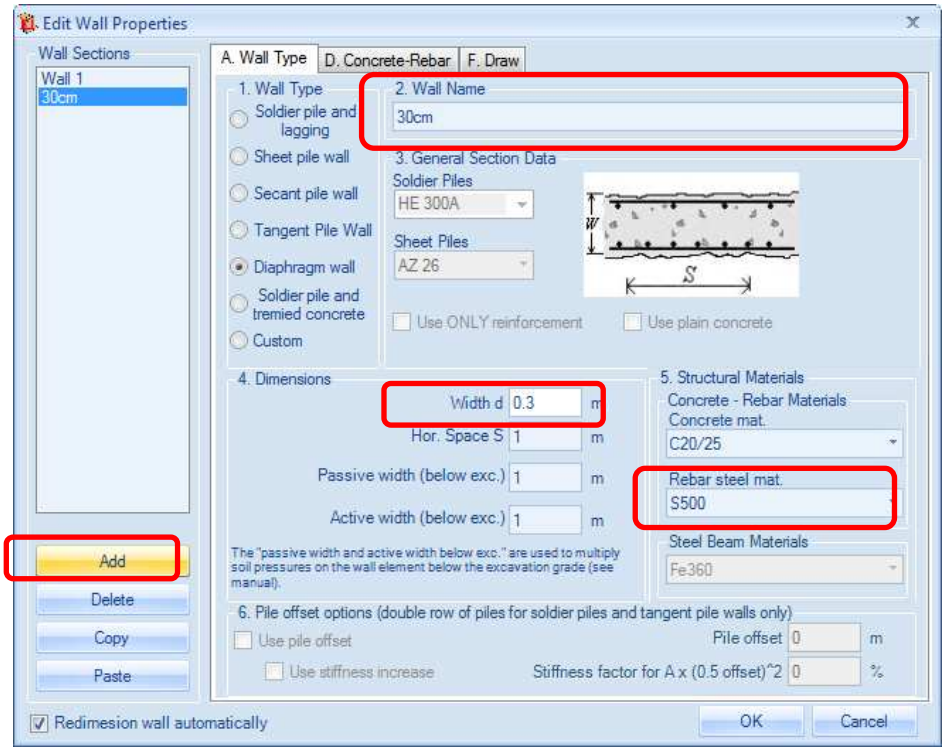
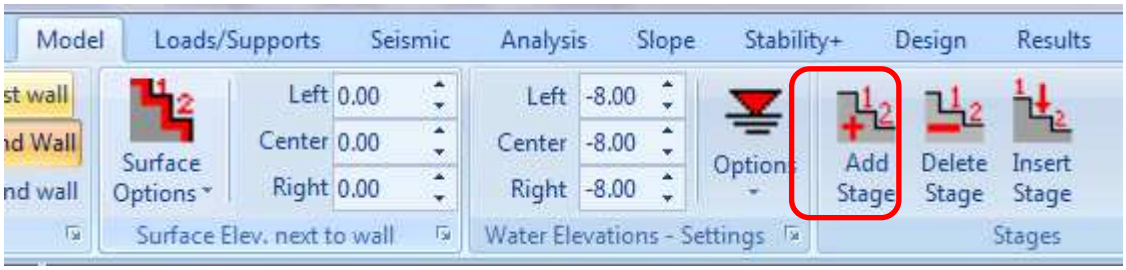
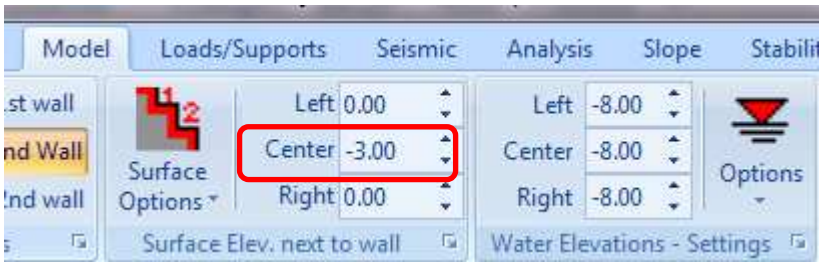


Figure 3: Select Edit wall Sections then add a 2nd wall and change the width to 30cm

Next add a stage and change the excavation on the center to -3m.





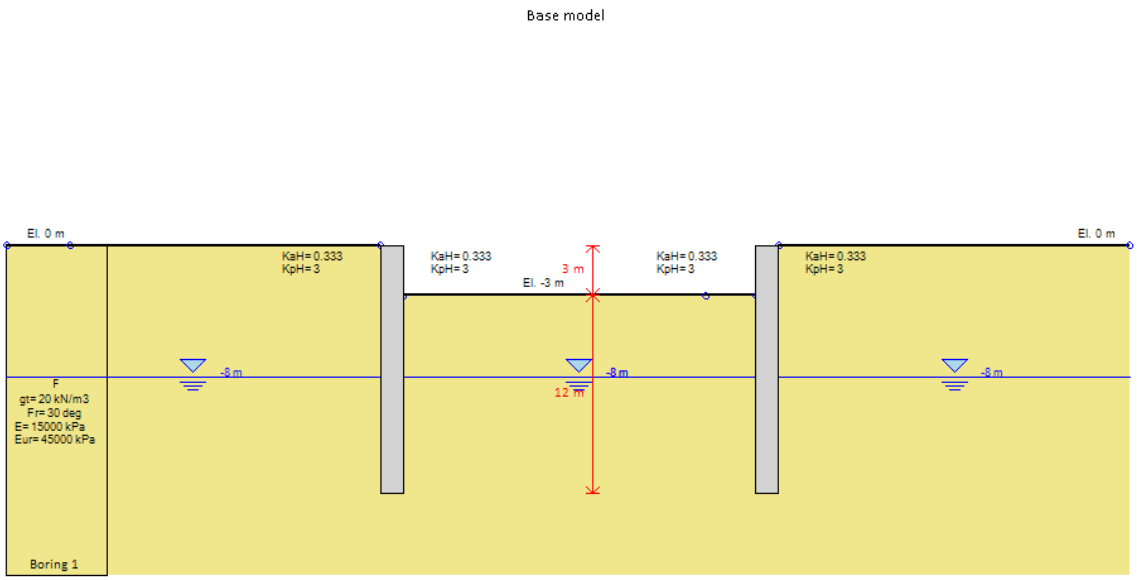


Figure 4: Add stage 1 and excavate in the center

Now, on the 2nd stage we will install the first set of liner walls on the slave nodes. First add a 2nd stage:

Now draw in one strut at elevation -2.5m. To draw the strut select first on the left wall at the desired elevation and then on the right wall (the elevation can be modified later):

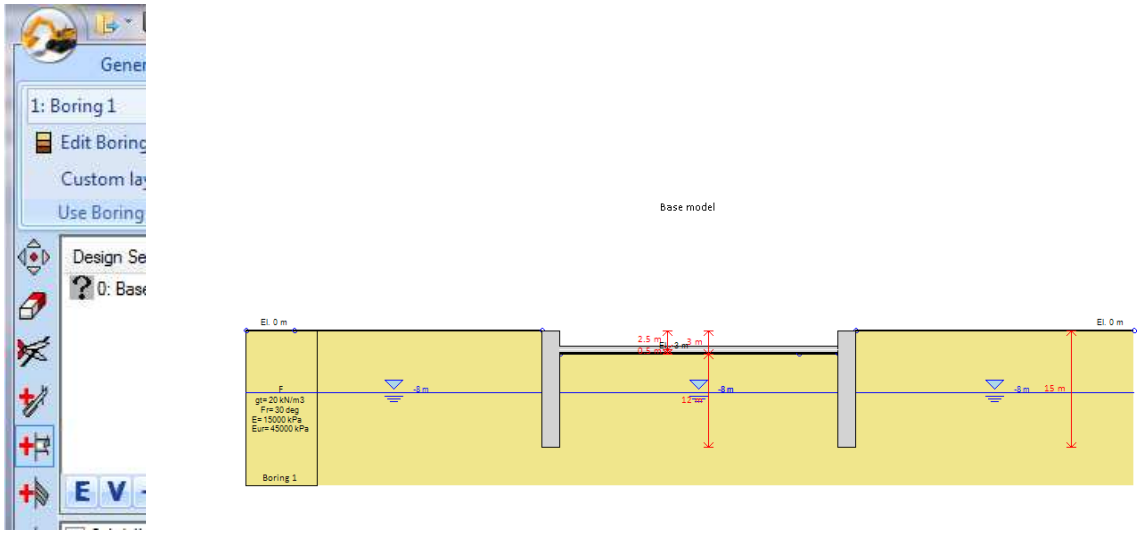


Figure 5: Struts installed in stage 2 at El. - 2.5.

Next, double click on each strut and change the elevations, and on Tab B, select the Slave node option:

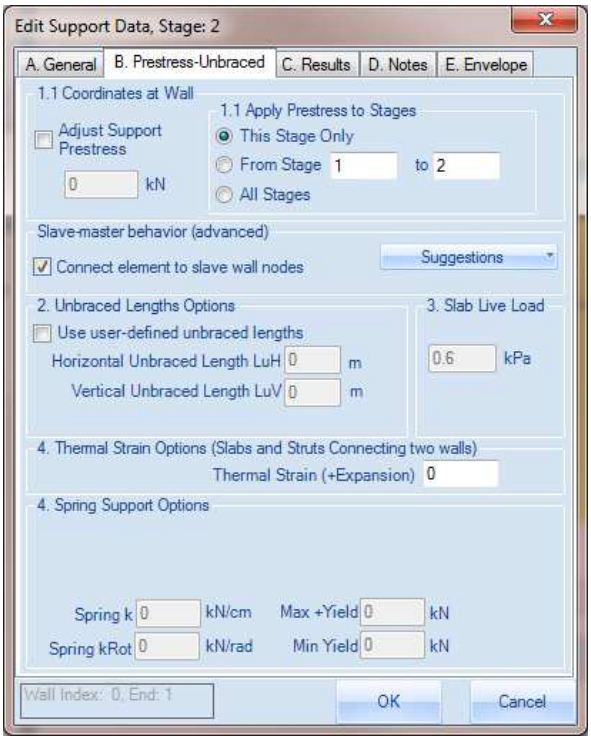


Figure 6: Change strut elevation and select option Connect element to slave wall nodes.

Next add a new stage and change the excavation on the center to -9m:

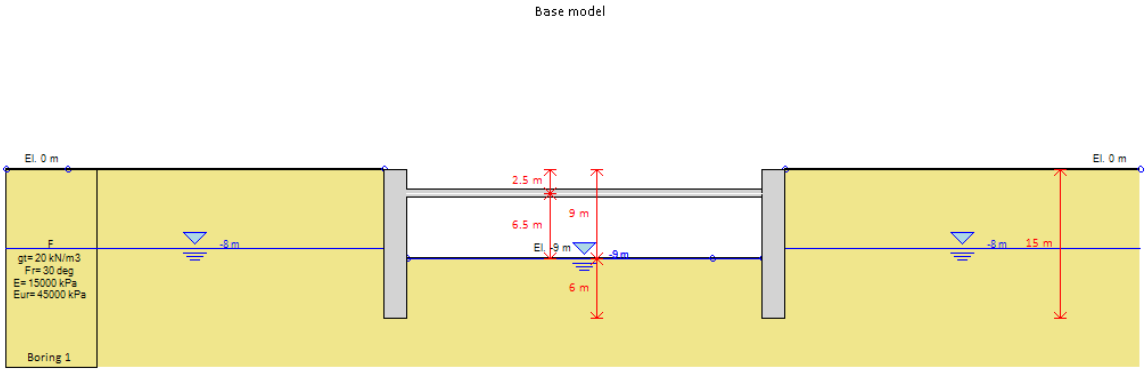
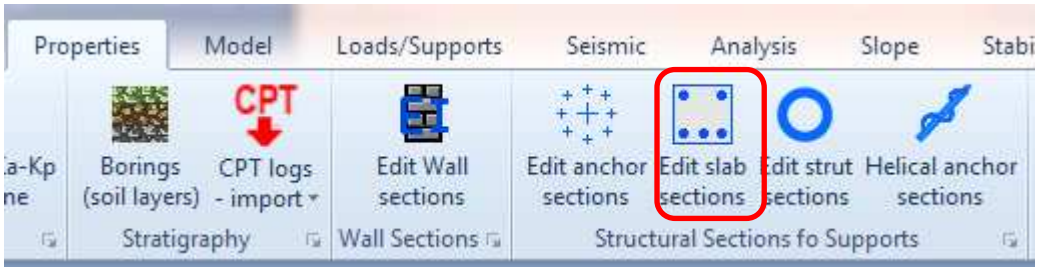


Figure 7: Stage 3, excavate to El. -9m on center.

Now add a new stage (stage 4). Next add a new slab that is 1m in thickness at elevation -8.5m. First define the slab properties:



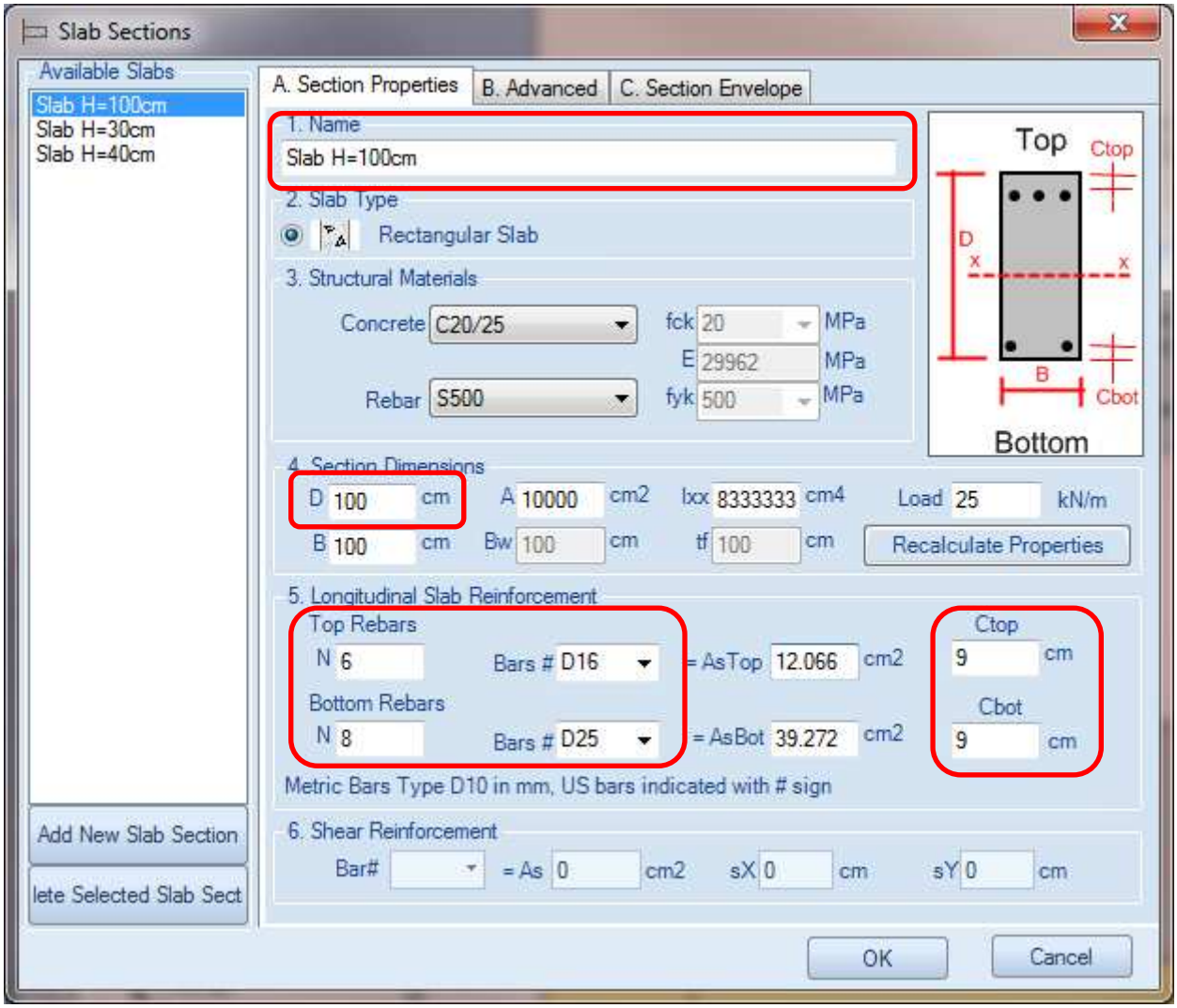


Figure 8: Define new slab section

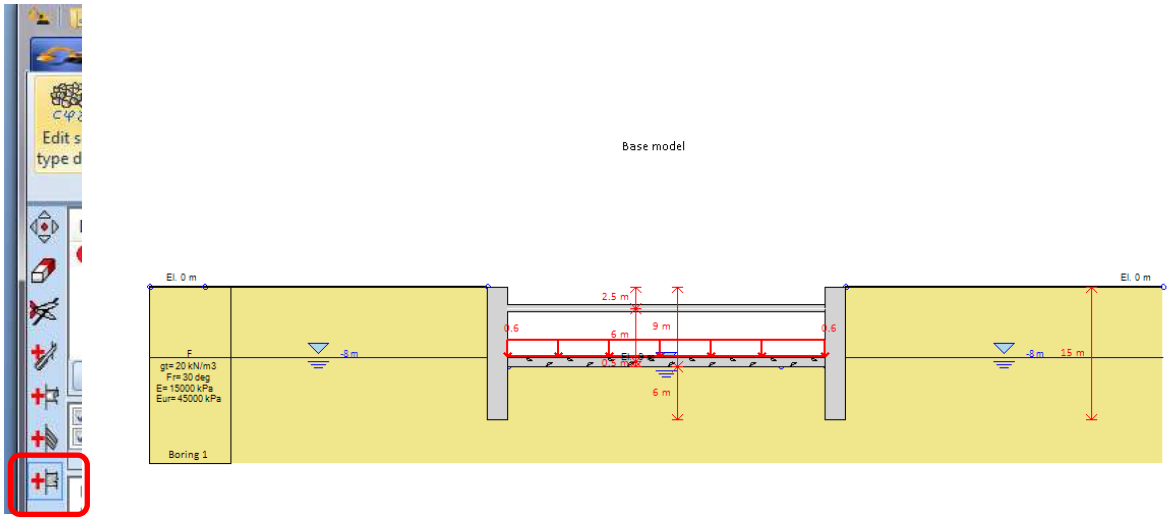
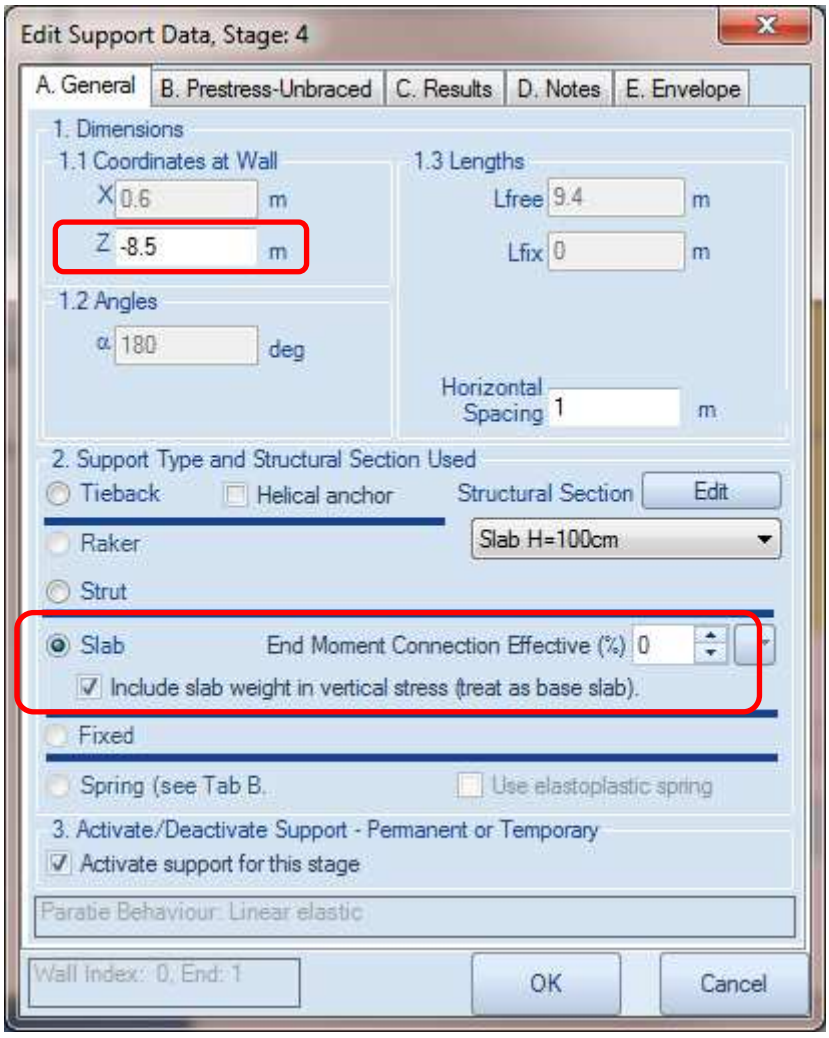
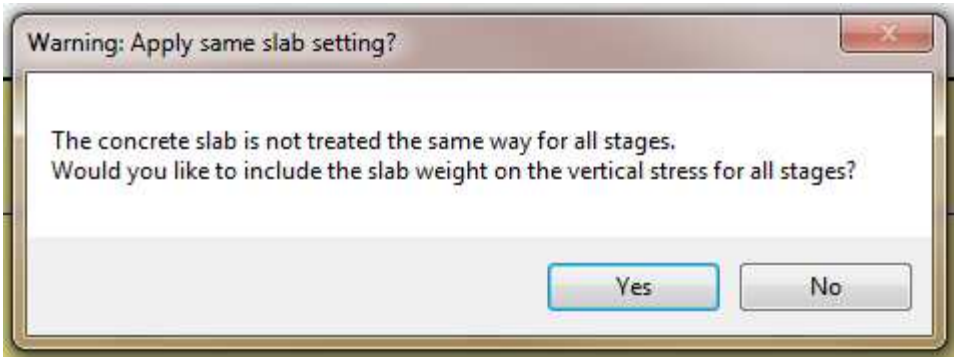


Figure 9: Stage 4, add slab select first on left wall then on right wall. Then double click on the slab.



Change the slab elevation, and select the option "Include slab weight in vertical stress".
Press OK.



Select YES.

Now add a new stage (stage 5), and change the water elevations to -7 on all sides (left, center, and right):

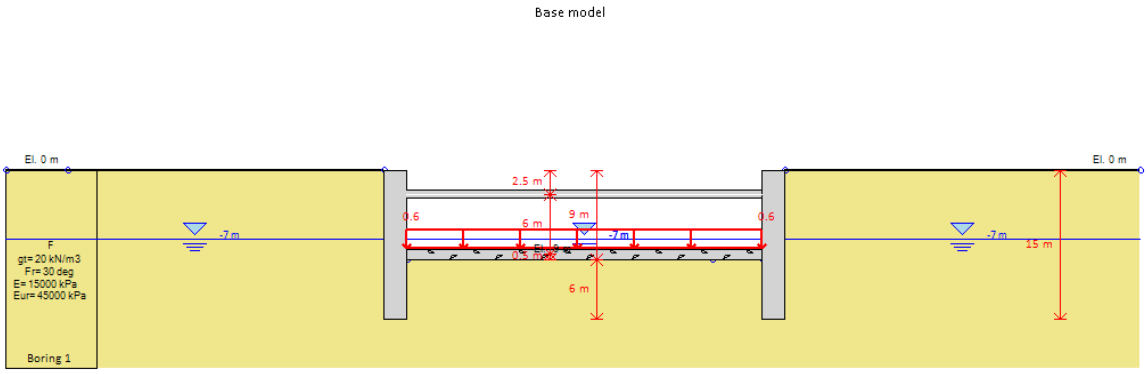
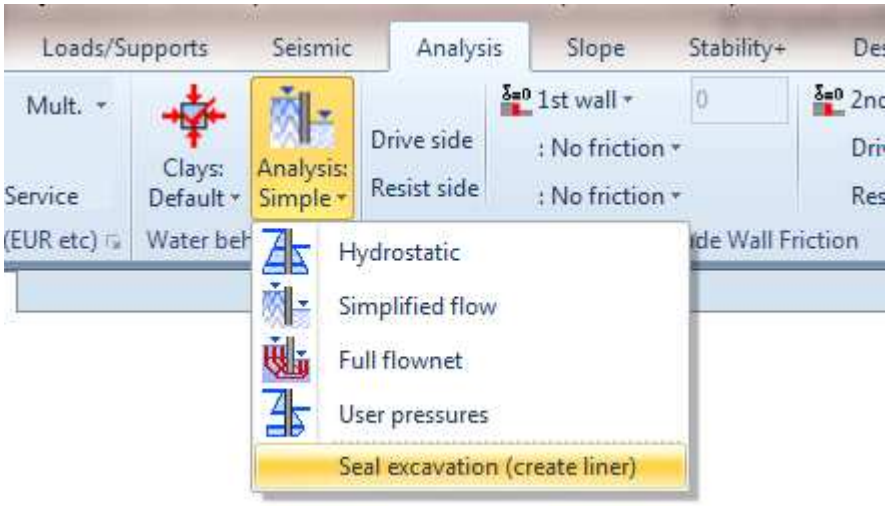


Figure 10: Stage 5, excavation on center to El. -9m, slab installed, and water at -7.

Now create a seal on the excavation (Lining effect):

Go to the Analysis tab, and then advanced options. Then select the option Seal excavation (create liner)



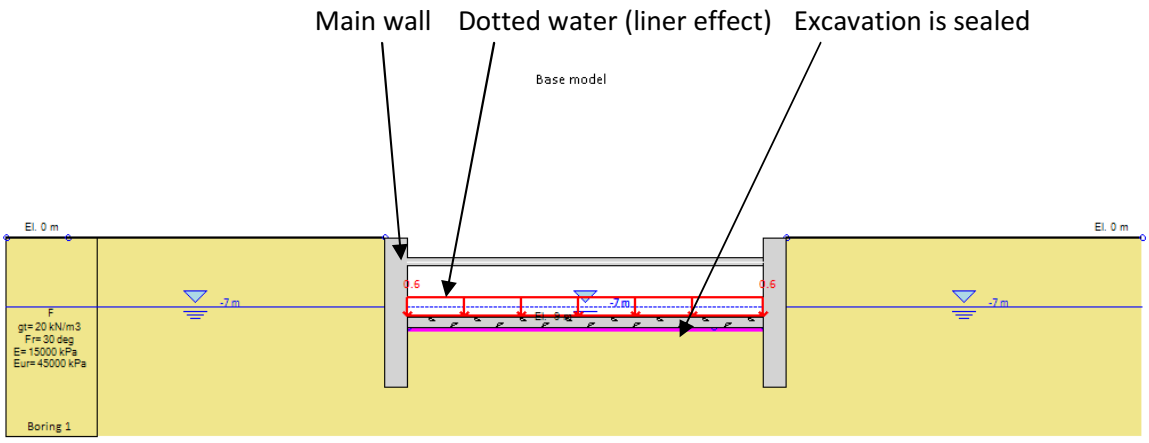
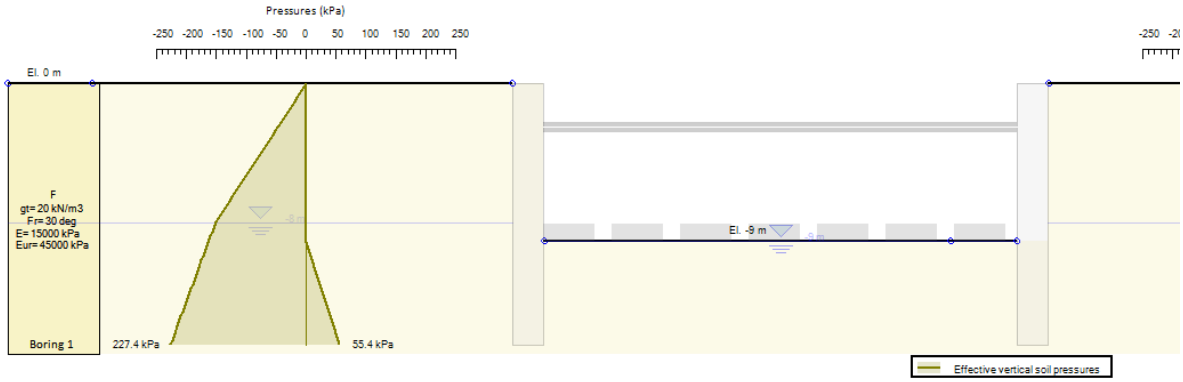
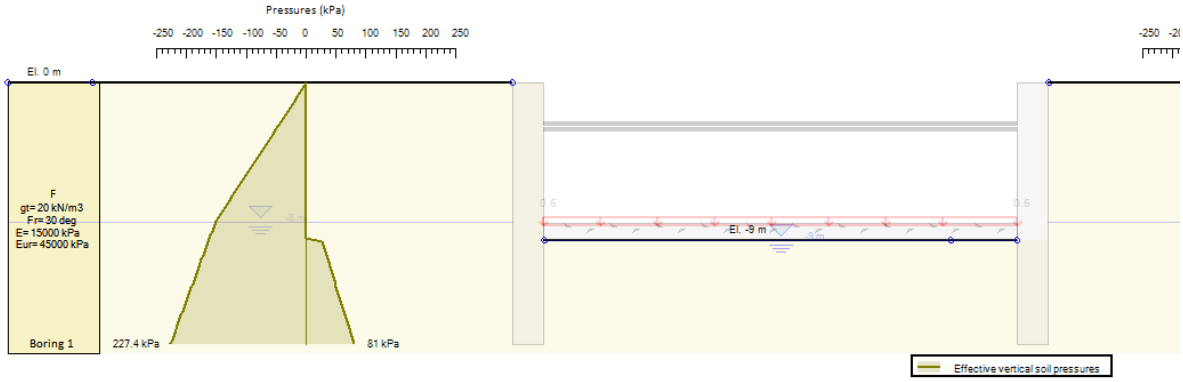


Figure 11: Stage 5, seal effect applied.

Now press calculate near the screen bottom to analyze this example.

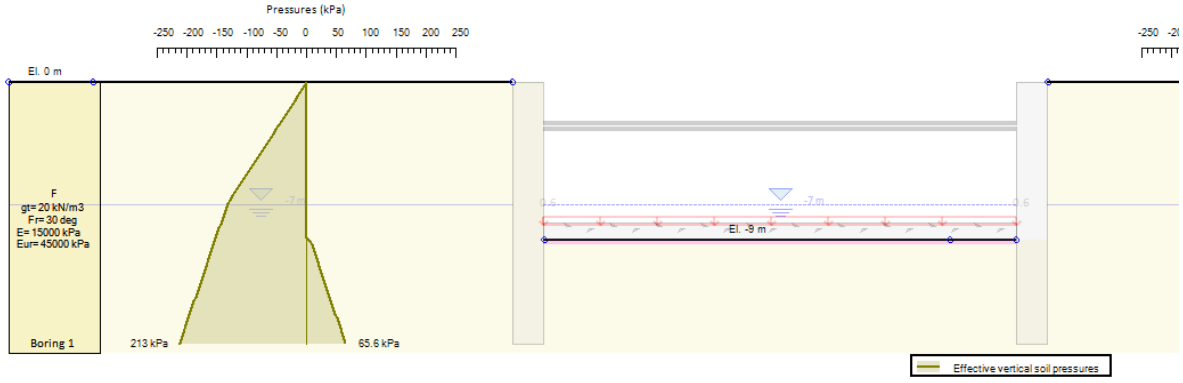


Stage 3: Vertical effective stress with no slab and no water seal (55.4 kPa)



Stage 4: Vertical effective stresses with slab included (no lining effect). Note: 55.4 kPa + Slab dead 25 Kpa + Slab live load 0.6 kPa = 81 kPa

Base model



Stage 5: Vertical effective stresses with slab included and lining effect.

Vertical eff. stress= 6m x 20 kN/m^3 + (25 kPa+ 0.6 kPa) - (8m water depth x 10 kN/m^3) = 65.6 kPa