
PLAXIS

CONNECT Edition V21.01

PLAXIS 2D - Tutorial Manual - Construction of a road embankment [ADV]



Last Updated: March 16, 2021

Excavation and dewatering [ADV]

In this tutorial lowering the groundwater level and the flow around a sheetpile wall will be analysed. The geometry model of the tutorial [GUID-FEE7DEBF-F110-47DB-AE3D-6F8D118A4B44](#) will be used. The **Well** feature is introduced in this example.

Create and assign material data set

The material parameters remain unchanged from the original project. The used groundwater parameters are shown in the table below.

Table 1: Flow parameters

| Parameter | Name | Silt | Sand | Loam | Unit |
|--------------------------------------|-------|---------------|---------------|---------------|-------|
| Groundwater | | | | | |
| Data set | - | USDA | USDA | USDA | - |
| Model | - | Van Genuchten | Van Genuchten | Van Genuchten | - |
| Soil - Type | - | Silt | Sand | Loam | - |
| < 2µm | - | 6 | 4 | 20 | % |
| 2µm - 50µm | - | 87 | 4 | 40 | % |
| 50µm - 2mm | - | 7 | 92 | 40 | % |
| Flow parameters - Use defaults | - | From data set | From data set | From data set | - |
| Permeability in horizontal direction | k_x | 0.5996 | 7.128 | 0.2497 | m/day |
| Permeability in vertical direction | k_y | 0.5996 | 7.128 | 0.2497 | m/day |

To create the project:

1. Open the project defined in the tutorial [GUID-FEE7DEBF-F110-47DB-AE3D-6F8D118A4B44](#).
2. Save the project under a different name (e.g. 'Flow around a sheet pile wall').

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Define the structural elements

Define the structural elements

1. In the **Structures** mode click the **Create hydraulic conditions** button  in the side toolbar.
2. Select the **Create well** option  in the appearing menu.
3. Draw the first well by clicking on (42 20) and (42 17).
4. Draw the second well by clicking on (58 20) and (58 17).

Generate the mesh

1. Proceed to the **Mesh** mode.
2. Select the cluster and two wells as shown in the figure below. In **Selection Explorer** specify a **Coarseness factor** of 0.25.

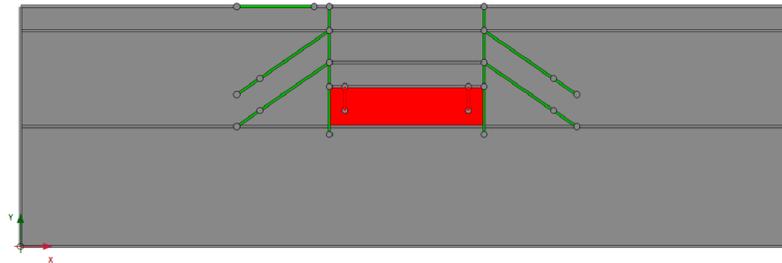


Figure 1: Indication of the local refinement of the mesh in the model

3. Click the **Generate mesh** button  to generate the mesh. Use the default option for the **Element distribution** parameter (Medium).
4. Click the **View mesh** button  to view the mesh.

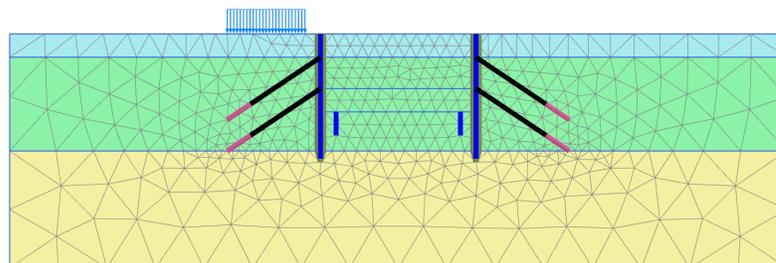


Figure 2: The generated mesh

5. Click the **Close** tab to close the Output program.

Define and perform the calculation

- Proceed to the **Staged construction** mode. The groundwater flow analysis performed in phase 6 has to be modified.

Phase 6: Dewatering

In this phase the wells will be used to lower the phreatic level in the excavation down to $y = 17$ m. This corresponds to 3 m below the final excavation level.

1. Multi-select the wells in the model and activate them.
2. In the **Selection explorer** the behaviour of the wells is by default set to **Extraction**.
3. Set the discharge value to $1.5 \text{ m}^3/\text{day}/\text{m}$.
4. Set the h_{\min} value to 17 m. This means that water will be extracted as long as the groundwater head at the wall location is at least 17 m.

The figure below shows the parameters assigned to the wells in the **Selection explorer**

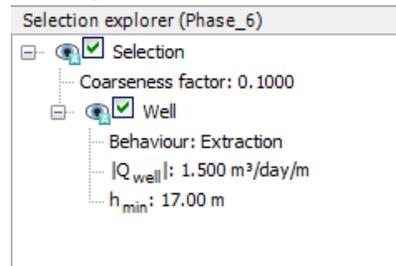


Figure 3: Well properties

Execute the calculation

The definition of the calculation process is complete.

1. Click the **Calculate** button  to calculate the project.
2.  Save the project after the calculation has finished.

Results

To display the flow field:

1. Select the Phase 6 in the drop down menu.
2. Click the menu **Stresses > Groundwater flow > $|q|$** .

A scaled representation of the results (scale factor = 5.0) is shown:

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Results

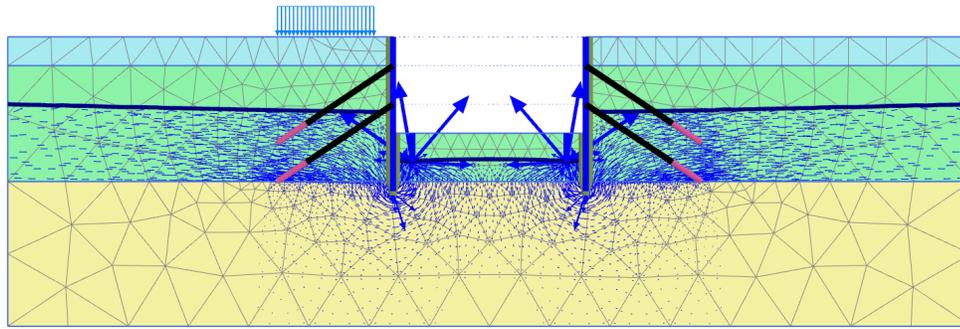


Figure 4: The resulting flow field at the end of Phase 6

Click the menu **Stresses > Pore pressures > Groundwater head**. Compare the results with the ones of the Phase 6 of the project defined in the tutorial [GUID-FEE7DEBF-F110-47DB-AE3D-6F8D118A4B44](#).

In the following figure, the resulting groundwater head with and without the wells are displayed.

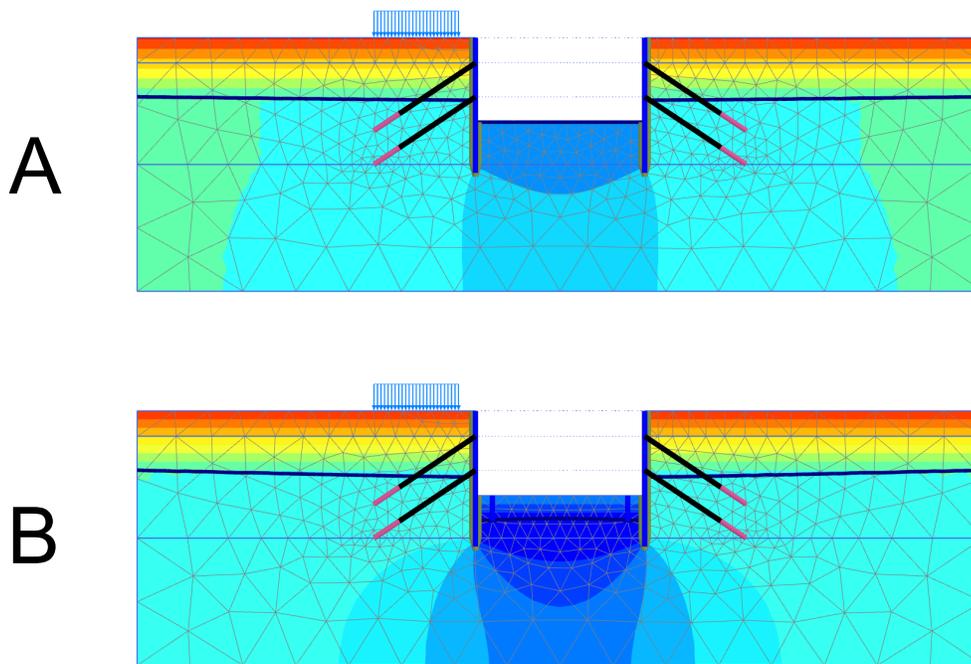


Figure 5: Comparison of the resulting groundwater head

A: Groundwater head (Phase 6 in the tutorial [GUID-FEE7DEBF-F110-47DB-AE3D-6F8D118A4B44](#))

B: Groundwater head (Phase 6 in the current project)