

PROJECT 2 – GROUNDWATER EXTRACTION (2025-2026)

1. Projects dealing with the extraction of ground water in order to get a dry building pit

- The diameter of the tubes of the extraction wells is 20 cm. In practice, around the extraction filters drainage material (sand/fine gravel) is placed resulting in a diameter of the extraction well of $20\text{ cm} + 2 \times 10\text{ cm} = 40\text{ cm}$.
- The extraction wells are installed till the depth of the phreatic layer
- The scope of the extraction is to lower the water sufficiently. In practice this results in a lowering of the water table to a depth = depth of the pit + 0.5 m
- The extraction wells are installed around the pit. The middle of the extraction wells is situated 1 m from the border of the building pit (distance 1 m to the middle of the extraction well)
- Two scenarios are possible
 - The number of extraction wells is given
 - You have to determine the flow in order to achieve a dry building pit (this means a necessary lowering of the ground water table (bottom – 0.5 m))
 - The dashed zone (in the pit) without comments is a zone where it is allowed that the water can rise to the bottom of the building pit (so no distance of 0.5 m between the bottom and the phreatic water level). Possible reasons for that can be the difficulty of accessibility or the risk of unacceptable settlements due to the presence of extraction wells close to adjacent constructions.
 - In some projects an additional condition is asked. This can be the case when for example an elevator has to be installed
 - Is the number of extraction wells sufficient ? Is it possible to reduce the number of extraction wells ? Please motivate. Can you optimize the layout of the extraction wells ?
 - The number of extraction wells is not given
 - You have to determine the number of extraction wells to lower the water table, but also a justified position of the extraction wells
 - The dashed zone (in the pit) without comments is a zone where it is allowed that the water can rise to the bottom of the building pit (so no distance of 0.5 m between the bottom and the phreatic water level). Possible reasons for that can be the difficulty for accessibility or the risk of unacceptable settlements due to the presence of extraction wells close to adjacent constructions.
 - In some projects an additional condition is asked. This can be the case when for example an elevator has to be installed.

2. Projects dealing with the extraction of ground water in order to avoid instability of the bottom of the building pit (reduction of equipotential height).

- The diameter of the tubes of the extraction wells is 20 cm. In practice, around the extraction filters drainage material (sand/fine gravel) is placed resulting in a diameter of the extraction well of $20\text{ cm} + 2 \times 10\text{ cm} = 40\text{ cm}$.
- The extraction wells are installed till the depth of the confined layer
- The scope of the extraction is to ensure the stability of the bottom of the pit. In practice this results in a necessary lowering of the pressure height in a way that the equation $0,9 \cdot G > P$ is fulfilled (G = own weight of the soil, P = upward force of the water). For the determination of P one has to take in account a supplementary pressure height of 0,5 m (= design value of the pressure height).
- The extraction wells are installed around the pit. The middle of the extraction wells is situated 1 m from the border of the building pit (distance 1 m to the middle of the extraction well)
- Two scenarios are possible
 - The number of extraction wells is given
 - You have to determine the flow in order to achieve a sufficient reduction of the water pressure
 - In a dashed zone (in the pit) without comments you don't have to consider the supplementary pressure height of 0,5 m. As a result, the safety factor in that area is lower. A possible reason for this can be the difficulty of having a sufficient access.
 - In some projects an additional condition is asked. This can be the case when for example an elevator has to be installed
 - Is the number of extraction wells sufficient ? Is it possible to reduce the number of extraction wells ? Please motivate. Can you optimize the layout of the extraction wells ?
 - The number of extraction wells is not given
 - You have to determine the number of extraction wells to lower the equipotential head, but also a justified position of the extraction wells
 - In a dashed zone (in the pit) without comments you don't have to consider the supplementary pressure height of 0,5 m. As a result, the safety factor in that area is lower. A possible reason for this can be the difficulty of having a sufficient access.
 - In some projects an additional condition is asked. This can be the case when for example an elevator has to be installed.
