

De-watering, Freezing & Grouting

Student's Name

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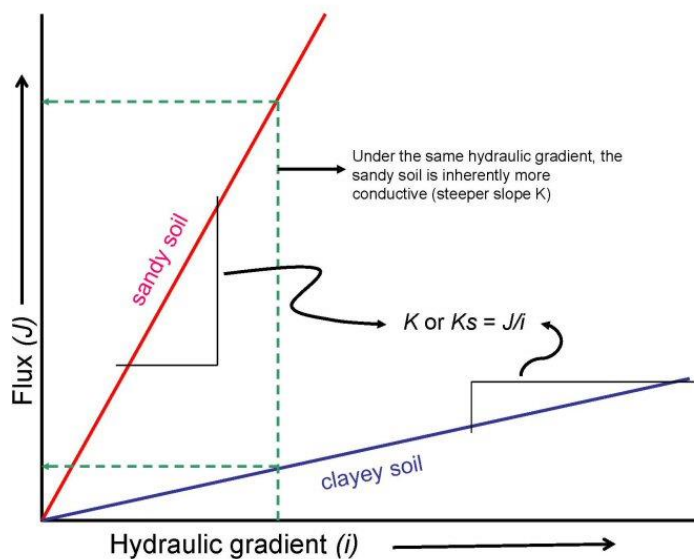
Design of Temporary Structures

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Hydraulic conductivity refers to the soil's ability to transmit water under saturated conditions or nearly saturated conditions. It is described as a proportionality constant with a porous medium-specific discharge under a hydraulic gradient unit. The hydraulic conductivity depends on the type of soil, and in this case, clayey soil would be considered to have a lower hydraulic conductivity (Ren & Santamarina, 2018). Under the hydraulic gradient, its slope is less steep, as illustrated in the diagram below. Soils with less steep slope are said to have lower hydraulic permeability.



In ensuring that soil is dry and firm, dewatering is required. Dewatering systems involve the groundwater control to lower its levels in the excavation vicinity locally. There are various types of dewatering systems, including wellpoint, educator wells, deep wellpoint, and open sump dewatering methods (Ren & Santamarina, 2018). Well points type applies lines or rings that are spaced closely and installed around the area of excavation. The wells are joined to a header pipe and then pumped. The pumps are capable of handling air and water. Conversely, the process mainly operates using the suction, which implies that drawdown is limited to about six meters

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under the well point level. When deeper drawdown is needed, there must be multiple-well points stages used.

The sump pumping system enhances the seeping of the groundwater into the area of excavation. It is then collected in sumps and by solids handling and high powered pumps pumped away. It is typically applied in areas with shallow excavation. Like the Well points type, deep wells use bored wells pumped by submersible pumps, which lowers the groundwater level below the exaction level. Usually, wells that are installed on comprehensive centers around the excavation are outside the perimeter. This type of dewatering system is appropriate for deep excavations, which requires large liquid drawdowns. Unlike the well-point and deep points, which are suitable in deep excavations, sump pumping is used in shallow crater areas.

Unsuitable dewatering systems may lead to adjacent property damage as well to the environment. It is essential to control the accumulation of water behind the TERS failure, leading to dewatering failures (Ren & Santamarina, 2018) . In this case, I will evaluate the shotcrete heavy rains case where there was no adequate control of the groundwater and the structures that exists required alternate support systems that would reduce the chances of risk. To avoid the failures, I would take extra measures to adequately control the groundwater and provide alternate support systems to the existing structures.

First, I would ensure that the dewatering process is not during the heavy rains since the infiltration rate is lower, and water would move slower. In this case, the system would function well, and the groundwater level would be well controlled. In providing alternate support systems to the existing structures to avoid the failures, I would ensure that dewatering activities were directed to a buffer, especially a wooded buffer.

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Ground freezing a technique of construction applied in situations where soil stabilization is required so that it do not collapse during excavations is essential. Some of the conditions that may lead to ground freezing include leakage of contaminated soil with radioactive elements. Another situation is when wide, wide tunnels are required to be built through or under a soil that initially supported existing infrastructure and would be expensive or difficult to keep my use of more traditional excavation methods. When the temperature is below the temperature of the ground, there will be the condensation of the liquid-vapor, which will make the ground permanently frozen (Li et al. 2019).

Jet grouting is a versatile modification of the ground system that establishes in situ geometries of grouted soil by using a monitor grouted attached to the drill system grill. The process applies special drill tooling, consisting of an attached monitor at the multi-chamber drill stem end. The monitor is then advanced to the aimed maximum depth treatment where incitement of time high velocity is done through nozzles on the monitor side. The jets mix and erode the in situ soil simultaneously with a binder as the jet grout monitor and drill system are raised and rotated. Until the treatment zone, upper limits are reached, the process continues where the hole is backfilled, and the tooling withdrew (Moayed & Azini, 2020).

REFERENCES

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