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Ground improvement techniques for RandstadRail, Rotterdam

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RandstadRail is a future light-rail link between the cities of Rotterdam, The Hague and Zoetermeer in the Netherlands. For the realization of RandstadRail in the city area of Rotterdam two bored tunnels of 2.4 km length are now being constructed. The bored tunnels are placed mainly in the Pleistocene sand layers. However the tunnels adjacent to the starting and receiving shafts are located in soft Holocene clay layers. At these locations ground improvement is necessary. In the project several ground improvement techniques are used.

To improve the embedment of the bored tunnels jet grouting and mixed in place are used. Also a ground replacement technique is used. Soft soils are excavated and replaced by sand. This sand has been compacted by vibrating.

The requirements of the ground improvement are defined in the contract. Before and after realizing the jet grouting and the soil deep mixing intensive testing has been done to determine the strength and the stiffness of the soil.
However using these improvement techniques soil displacements in the subsoil are encountered. So in urban areas these ground improvement techniques can have a negative side effect to the surrounding structures.

The paper gives a general overview of the project. The use of ground improvement techniques with respect to the design of the bored tunnels is researched. The test results of the ground improvements are shown as well as the soil displacements.

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