

Infrastructure design integration to optimize structures and minimize groundwater impacts. Case of a bottom slab and groundwater by-pass integration in La Sagrera railway station, Spain.

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Underground constructions search the most efficient solutions to increase safety, reduce impacts in both underground construction (such as bottom slab water pressures) and groundwater (such as groundwater barrier effect), reduce future maintenance processes and ensure that everything is implemented by the minimum cost. Even being all the previous solutions directly related to groundwater, independent solutions are usually designed to independently deal with each problem. This paper shows how with a groundwater by-pass design that enables the groundwater flow through the structure it is possible to provide an homogeneous distribution of the water pressures under the bottom slab and reduce the barrier effect produced by the structure. The new integrated design has been applied to the largest infrastructure of Barcelona: La Sagrera railway station. Through a hydrogeological model has been possible to test the project and the integrated designs in three different scenarios. This new solution resolves the barrier effect produced by the structure and optimizes the bottom slab, reducing considerably the costs and increasing safety during the construction phase.