

Conception of Increasing the Efficiency of Excavation Shoring by Prestressing Diaphragm Walls

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Abstract : The construction of diaphragm walls as excavation shoring as well as part of deep foundations is widely used in geotechnical engineering. Today's design challenges lie in the optimal dimensioning of the cross-section, which is demanded by technological considerations. Also in force is the issue of optimization and sustainable use of construction materials, including reduction of carbon footprint, which is currently a relevant challenge for the construction industry. The author presents the concept of an approach to achieving increased efficiency of diaphragm wall excavation shoring by using structural compression technology. The author proposes to implement prestressed tendons in a non-linear manner in the reinforcement cage. As a result bending moment is reduced, which translates into a reduction in the amount of steel needed in the section, a reduction in displacements, and a reduction in the scratching of the casing, including the achievement of better tightness. This task is rarely seen and has not yet been described in a scientific way in the literature. The author has developed a dynamic numerical model that allows the dimensioning of the cross-section of a prestressed shear wall, as well as the study of casing displacements and cross-sectional forces in any defined computational situation. Numerical software from the Sofistik - open source development environment - was used for the study, and models were validated in Plaxis software . This is an interesting idea that allows for optimizing the execution of construction works and reducing the required resources by using fewer materials and saving time. The author presents the possibilities of a prestressed diaphragm wall, among others, using. The example of a diaphragm wall working as a cantilever at the height of two underground floors without additional strutting or stability protection by using ground anchors. This makes the execution of the work more criminal for the contractor and, as a result, cheaper for the investor.

Keywords : prestressed diaphragm wall, Plaxis, Sofistik, innovation, FEM, optimisation

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