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2D Numerical Analysis for Determination of the Effect of Bored Piles Constructed against the Landslide near Karabuk University Stadium

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Abstract : Landslides cause remarkable damage and loss of human life every year around the world. They may be made more likely by factors such as earthquakes, heavy precipitation, and incorrect construction activities near or on slopes. The stadium of Karabük University is located at the bottom of a very high slope. After construction of the stadium, severe deformations were observed on the social activity area surrounding the stadium. Some inclinometers were placed behind the stadium to detect the possible landslide activity. According to measurements of the inclinometers, irregular soil movements were detected at depths between 20 m and 45 m. Also, significant heaves and settlements were observed behind the stadium walls located at the toe of the slope. The heaves indicate that the stadium walls were under threat of a significant landslide. After inclinometer readings and field observations, the potential failure geometry was estimated. The protection system was designed based on numerous numerical analysis performed by 2-D Plaxis software. After the design was completed, protective geotechnical work was started. Before the geotechnical work began, new inclinometers were installed to monitor earth movement during the work and afterward. The total horizontal length of the possible failure surface is 220 m. Geotechnical work included two-row-pile construction and three-row-pile construction on the slope. The bored piles were 120 cm in diameter for two-row-pile construction, and 150 cm in diameter for three-row-pile construction. Pile length is 31.30 m for two-row-pile construction and 31.40 m for three-row-pile construction. The distance between two-row-pile and three-row-pile construction is 60 m. With these bored piles, the landslide was divided into three parts. In this way, the earth's pressure was reduced. After a number of inclinometer readings, it was seen that deformation continued during the work, but after the work was done, the movement reversed, and total deformation stayed in mm dimension. It can be said that the protection work eliminated the possible landslide.

Keywords : landslide, landslide protection, inclinometer measurement, bored piles
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