Analysis of Pile Spacing of Anti-slide Piles in Anti-trapezoidal Compression Zone Based on Soil Arch Coupling

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Abstract: Soil arching effect is a phenomenon of pile-soil stress transfer, that is, the stress borne by soil is transferred to pile. Therefore, soil arching effect can be defined as a shear stress transfer phenomenon, or as the stress borne by yield soil is transferred to its adjacent soil or constrained soil. The existence of soil arching effect makes the calculation of anti-slide piles very complicated. Starting from the stress characteristics of cantilever pile and the formation mechanism of soil arching effect, this paper discusses the stress intersection area behind the pile and introduces the "inverted trapezoid" stress compression area. The stress state of the "inverted trapezoid" compression zone of the soil arch foot behind the pile is obtained from the mechanics of materials. At the same time, in combination with the M-C strength criterion, the expression of pile spacing is established, taking into account the “inverted” compression area strength of the soil arch foot behind the pile, the compression area strength of the soil arch foot at the side of the pile, and the combined static equilibrium state of the soil arch, so as to delimit the layout range of pile spacing on the premise of ensuring the soil arch effect as the dominant force transmission. The results are verified by an engineering example, and it is concluded that the method in this paper is more practical than the theoretical modeling method of “triangle” compression zone.

Key words: slope, soil arching effect, inverted trapezoid compression zone, stressstate, pile spacing

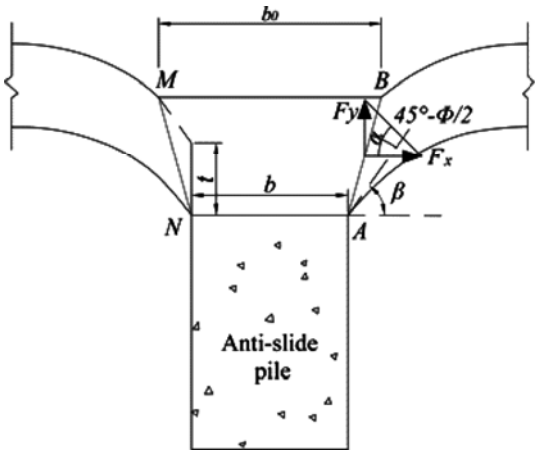

Fig. 1. Inverted trapezoidal compression zone calculation mode.l

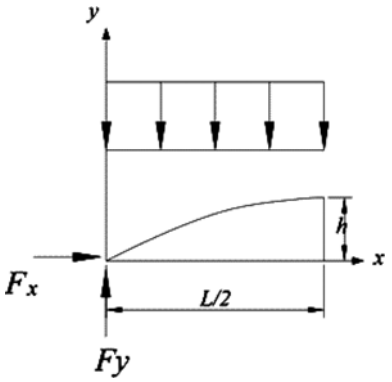

Fig. 2. Reasonable arch axis calculation sketch.

References

Jiang, L.W., Huang, R.Q., Jiang Z.X., 2006, Analysis of soil arching effect between adjacent piles andtheir spacing in cohesive soil Rock and SoilMechanics, 27(3): 445–450(in Chinese with English abstract).

Wang, C.H., Chen,Y.B., 2001, Lin, L.X., Soil arch mechanical character and suitable space between one another anti－sliding pile. Journal of MountainScience, 19(6): 556–559(in Chinese with English abstract).

Wang, S.C.,1997, Anti-slide pile spacing of the lower limit equation. Industrial Construction, 27(10): 32–36 (in Chinese with English abstract).

Yang, M., Yao, L.K., Wang, G.J., 2008, Study of centrifuge model tests and numerical simulation on soil arching in space of piles, Rock and Soil Mechanics, 29(3): 817–822(in Chinese with English abstract).

Zhou D.P., Xiao S.G., Xia X., Discussion on rational spacing between adjacent anti-slide piles in some cutting slope projects. Chinese Journal ofGeotechnical Engineering, 2004, 26(1): 132–135 (in Chinese with English abstract).

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