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

WANG Maohui*, SU Peidong and HAN Jinchen

College of Geosciences and Technology, Southwest Petroleum University, Sichuan 610500, China

Citation: Wang et al., 2019. Analysis of Pile Spacing of Anti-slide Piles in Anti-trapezoidal Compression Zone Based on Soil Arch Coupling. Acta Geologica Sinica (English Edition), 93(supp.2): 366.

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, stress state, pile spacing

Fig. 1. Inverted trapezoidal compression zone calculation mode.

Fig. 2. Reasonable arch axis calculation sketch.

References

About the first author
WANG maohui, male, born in 1994 in Guangyuan City, Sichuan Province; postgraduate student; graduated from Southwest Petroleum University. He is now interested in the study on geological engineering research and the reasonable pile spacing of soil arching effect. Email: Wang_maohuicc@126.com; phone:15680632626.

* Corresponding author. E-mail: wang_maohuicc@126.com