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THE EFFECTION OF STRESS PATH ON THE ROCK RELAXATION AREA OF LARGE-SECTION TUNNEL

Zongxue YAN [1,2] Yingguang FANG [1] Bo WU [1]

([1] Institute of Civil Engineering and Transportation ,South China University of Technology, Guangdong Guangzhou 510641; State Key Laboratory of Subtropical Building Science Guangdong Guangzhou 510641;[2] Guangzhou Highway Development Corporation Guangdong Guangzhou 510080)

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Introduction

With the development of high grade road way and the requirement of increasing transport volume, China began to construct large-section tunnel, as well as four lanes tunnel. At beginning, four single-hole four-lane tunnels have been constructed in China, including Dage Mountain tunnel in Guizhou province, 21.04m wide and 11.45m high(exclusive of inverted arch), Han Village tunnel[1] on Shengyang-Dalian high way,21.24m wide and 15.52m high,Yabao tunnel[2] ,20.90m wide and 13.48m high in shenzheng city and Dragon Head Mountain tunnel[3] in Guangzhou city, 21.6m wide and 13.58m high.

Until now, few four-lane tunnels were constructed at home and abroad. Therefore, the design theory is still immature, mainly using analogy design, for instance, designers take two-lane tunnel for reference while calculating rock load of four-lane tunnel. Though, there are some related specifications in highway tunnel design standard, railway tunnel design standard, hydraulic tunnel design standard, as well as in Barton, Bieniawsky, Goel and Jethwa, Singh formulas[4]-[10], the results calculated according to those standards and formulas differ greatly from the reality. Many scholars have done research into four-lane tunnel: Huang Lunhai [11]and Wan Mingfu [1]did model test on the excavation of four-lane tunnel; Gen Luanfeng and Wan Mingfu[12]-[13] did mechanics characteristic analysis of excavation of single-hole four-lane tunnel; Zhang Binqiang, Gong Chengbin, Liu Tong and Li Wengang[14]-[17]did numerical analysis and calculation ; Qu Haifeng[18] did a research on loading model of large section tunnel in construction progress, from which he came to the conclusion that the load influence coefficient of pilot tunnel on both sides shows in formula as follow, $\eta 1,= \eta 2$.

The rock stress is constantly changing becuase construction of large section tunnel mainly excavates on double sides of pilot tunnel, which will frequently disturb the surrounding rock of pilot tunnel while digging the soil of middle and two sides. Thus, the variation of stress path leads the redistribution of surrounding rock stress, and the extension and alteration in the plastic zone. As a result, the relaxation-areabetween the left guide hole and right guide hole appears different, and the process load of surrounding rock varies, and load influence coefficients, namely, $\eta 1$ and $\eta 2$ in left and right guide holes are not the same. Therefore, it is necessary to make a further study on load effect among the guide holes of large section tunnels.