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大断面越江盾构隧道管片拼装方式对结构内力的影响效应研究

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STUDY ON THE EFFECT OF ASSEMBLING METHOD ON THE INNER FORCE OF SEGMENTAL LINING FOR CROSS-RIVER SHIELD TUNNEL WITH LARGE CROSS-SECTION

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摘要 大断面越江隧道管片拼装方式对结构内力的影响一直引人关注,由于拼装方式的不同将引起管片结构内力的分布与量值的变化。鉴于此,该文对圆形盾构隧道管片拼装效应的产生机理进行了理论分析,着重探讨了纵向相互作用力对管片环向内力的影响,随后以南京长江隧道为工程背景,对其管片在通缝与错缝拼装条件下结构环向内力分布及错缝拼装下目标管片内力沿圆周及幅宽方向的内力分布规律开展了原型试验研究。结果表明,由于环间的相互作用效应,使错缝结构局部区域弯矩呈现出加强的效果。在纵向螺栓作用区域,管片环向弯矩增幅、轴力降幅较大。沿管片幅宽方向,正弯矩呈“凹”型分布,负弯矩呈“凸”型分布,轴力呈“凸”型分布。该研究结果可为大断面水下盾构隧道的设计、施工和相关研究提供重要参考。

关键词: 水下盾构隧道 管片衬砌结构 原型试验 管片拼装效应 拼装方式

Abstract: The effect of assembling method on the inner force of segmental lining for cross-river shield tunnel with large cross-section has been concerned for a long time. Different assembling plan yields different distribution characteristics of inner force. In this paper, theoretical analysis is carried out to discuss the mechanism of assembling effect of circular shield tunnel, especially the effect of longitudinal interaction on circumferential inner force. Then based on Nanjing Yangtze River Shield Tunnel project, a prototype test is conducted to study the mechanical distribution characteristic of circumferential inner force in different assembling plan and the mechanical distribution characteristic of inner force of target segment (B5) along the circumference and width direction. The results show that, the effect of the interaction intensifies bending moment in local area when using staggered assembling, and the growth of bending moment and decline of axial force become larger near the longitudinal bolts. And along the width direction, the positive bending moment distributes as a concave type, the negative bending moment and axial force distribute as a convex type. The result can provide valuable references to design and construction of large-profile underwater shield tunnels; meanwhile it can also provide important reference to the correlative studies.

Key words: underwater shield tunnel segmental lining structure prototype test assembling effect assembling method

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