

论文

海底隧道钢拱架锈蚀对支护体系安全性的影响

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摘要:

为提高大断面海底隧道支护体系的安全性,对厦门海底隧道进行了有限元分析.在有水压和无水压2种情况下,分析了钢拱架锈蚀对自身承载能力和对初期支护混凝土、二次衬砌安全性的影响.分析表明:锈蚀率达到80%时,钢拱架与混凝土之间的粘结力和钢拱架的承载能力将完全丧失.随着钢拱架锈蚀,其弯矩降低系数与锈蚀率符合二次曲线关系,轴力降低系数与锈蚀率基本符合线性规律;初期支护混凝土边墙与拱顶处安全系数在无水压的情况下最大降低约5.5%,在有水压的情况下最大降低6.6%左右;二次衬砌边墙与拱顶处安全系数在无水压的情况下最大降低3.4%左右,在有水压的情况下最大降低约6.4%.

关键词: 海底隧道 钢拱架锈蚀 支护体系安全性

Influence of Steel Arch Corrosion on Security of Supporting System of Sub-sea Tunnel

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Abstract:

To raise the supporting system security of large cross-section sub-sea tunnels, FEM (finite element method) was used to analyze Xiamen sub-sea tunnel. The effects of steel arch corrosion on the load-bearing capacity of steel arches and the securities of preliminary lining and secondary lining were investigated under two conditions with or without hydraulic pressure. The research indicates that when steel arch corrosion rate is up to 80%, the load-bearing capacity and the bond force between steel arches and concrete will completely lose. With the corrosion of steel arches, the reduction factor of moment is a quadratic function of the corrosion rate, while the reduction factor of axial force is basically a linear function of the corrosion rate. Under the condition with hydraulic pressure, the safety factor of sidewall and arch crown decreases about 6.6% and 6.4% respectively for preliminary lining and secondary lining, while it reduces approximately 5.5% and 3.4% respectively for preliminary lining and secondary lining under the condition without hydraulic pressure.

Keywords: sub-sea tunnel; steel arch corrosion; security of supporting system

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