

学术论文

嵌埋CFRP筋组合石梁受弯性能试验研究

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摘要:

提出了花岗岩石梁嵌入CFRP筋组合石梁技术, 并进行了3根嵌入CFRP筋组合石梁和1根普通石梁的受弯性能试验研究。主要试验参数为嵌埋CFRP筋的直径和数量。试验分析了组合石梁的破坏形态、受弯承载力、变形性能、应变分布和CFRP筋的粘结滑移性能。试验结果表明: 普通花岗岩石梁达到开裂弯矩时即发生脆性断裂, 而通过在梁底受拉区嵌埋CFRP筋可以有效提高石梁受弯承载力和延性。嵌埋CFRP筋组合石梁的受弯承载力随着CFRP筋配筋率的增大而增大。CFRP筋配筋率对组合石梁的受力性能和破坏形态均有明显影响, CFRP筋的强度发挥水平随配筋率的增大而降低, 过大的配筋率可能使组合石梁的破坏形态由弯曲破坏转变为剪弯段的剪切破坏。嵌埋CFRP筋组合石梁的粘结锚固性能是影响组合石梁受力性能的重要因素。

关键词: 石结构 组合石梁 CFRP筋 表层嵌埋 静力试验 受弯性能

Experimental study on flexural behavior of NSM CFRP-stone composite beams

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Abstract:

A composite structural technique for improving the flexural performance of stone beams by mounting CFRP rods in the tensile region of stone beams was proposed. Three near-surface mounted (NSM) CFRP-stone composite beams and a conventional stone beam were tested to investigate their flexural behavior. The main test parameters were the amount and the diameter of NSM CFRP rods. The failure mode, flexural strength, deformation characteristics, strain distribution and bond-slip behavior between NSM CFRP rods and stone were studied. Test results indicate that the conventional stone beam fail due to brittle rupture as soon as the cracking moment has been reached, whereas the composite stone beams strengthened with NSM CFRP exhibit significant increases in flexural strength and ductility. The flexural strength of the composite stone beams increase along with the increase of CFRP reinforcement ratio. An increase of the CFRP reinforcement ratio leads to a higher flexural strength when failure is controlled by flexure, while an excessive amount of NSM reinforcement will not result in a significant increase in flexural capacity since shear failure occurred in flexure-shear regions of the beam. The bond-slip behavior between NSM CFRP rods and stone is an important factor that will affect the flexural behavior of composite stone beams.

Keywords: stone structure composite stone beam CFRP rod near surface mounted static test flexural behavior

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