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学术论文

GFRP筋活性粉末混凝土梁受力性能试验研究

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摘要:

为了研究GFRP筋活性粉末混凝土梁的受力性能，对8根梁进行三分点加载试验，获得了试验梁的开裂弯矩、极限弯矩以及各级荷载作用下的变形及裂缝分布与开展。试验结果表明：活性粉末混凝土试验梁纯弯区段开裂应变(750×10-6) 约为普通混凝土梁的7倍，开裂弯矩及截面塑性系数计算应考虑纵向受拉GFRP筋的有利影响。GFRP筋活性粉末混凝土梁正截面受弯破坏形式可分为纵向受拉GFRP筋被拉断而受压边缘活性粉末混凝土未被压碎的受拉破坏，受压边缘活性粉末混凝土被压碎(5500×10-6)而纵向受拉GFRP筋未被拉断的受压破坏，以及纵向受拉GFRP筋被拉断的同时受压边缘活性粉末混凝土被压碎的界限破坏等三种。对于受压破坏可按拉区应力为0.25倍活性粉末混凝土抗拉强度来考虑拉应力对正截面受弯承载力的贡献。对于受拉破坏则基于材料应力-应变关系通过数值积分迭代计算正截面受弯承载力。刚度及裂缝宽度计算的关键是合理计算使用阶段GFRP筋的拉应力，在计算GFRP筋拉应力时所用弯矩应为外荷载弯矩减去拉区活性粉末混凝土拉应力合力对压区合力点的弯矩。 图9表12参10

关键词: 混凝土梁 GFRP筋 活性粉末混凝土 静力试验 正截面受弯承载力 刚度 裂缝

Experimental research on mechanical performance of reactive powder concrete beams reinforced with GFRP bars

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Abstract:

To study the mechanical properties of GFRP bars reinforced RPC beams, tests of eight GFRP bars reinforced RPC beams were carried out. The mechanical properties such as cracking moment, ultimate moment, stiffness and cracks were studied by the one-third point loading tests. The test results show that the favorable influence of longitudinal GFRP reinforcement on cracking moment and plastic coefficient should be considered. The cracking strain (750×10-6) at the pure bending section of RPC beams is seven times of that of the ordinary concrete beams. There are three types of cross-sectional failure patterns of GFRP bars reinforced RPC beams. The tension failure is that the longitudinal GFRP reinforcement fractures while the concrete at compressive edge of the PRC is not crushed. The compression failure is that the concrete at compressive edge of the PRC is crushed (5500×10-6) while the longitudinal GFRP reinforcement does not fracture. The limit failure is that the rupture of the longitudinal GFRP reinforcement and the crushing of the concrete at compressive edge of the PRC occur at the same time. Under compression failure, the contribution of tensile stress to the flexural strength may be considered based on 0.25 times the RPC tensile strength. For tension failure, the flexural strength can be calculated by numerical iterative procedure based on the stress-strain relationship of materials. The key to the calculation of stiffness and crack width is the calculation of GFRP reinforcement tensile stress at service stage. The moment used in the calculation of GFRP reinforcement tensile stress should be the external moment minus the moment of resultant tensile stress of RPC tensile stress in tensile region to resultant point of compression region. 10Refs.In Chinese.

Keywords: concrete beam GFRP bars reactive powder concrete (RPC) static test flexural strength stiffness crack

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