



碳纤维布抗弯加固混凝土梁的火灾行为

*刘汾涛^{1,2}, 吴波^{1,3}, 魏德敏¹

(1. 华南理工大学亚热带建筑科学国家重点实验室, 广州 510640; 2. 广东水利电力职业技术学院, 广州 510635; 3. 上海建科院上海市工程结构新技术重点实验室, 上海 200032, China)

FIRE BEHAVIORS OF CONCRETE BEAMS STRENGTHENED WITH CARBON FIBER SHEET

*LIU Fen-tao^{1,2}, WU Bo^{1,3}, WEI De-min¹

(1. State Key Laboratory of Subtropical Building Science, South China University of Technology, Guangzhou 510640, China; (2. Guangdong Technical College of Water Resources and Electric Engineering, Guangzhou 510635, China; 3. Shanghai Key Laboratory of New Technology Research on Engineering Structure, SRIBS, Shanghai 200032, China)

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摘要 对4根碳纤维布抗弯加固混凝土梁和1根未加固对比梁进行了明火试验, 前者碳纤维布表面涂抹有非膨胀型防火涂料。试验考察了梁跨中裂缝对受拉钢筋温度的影响, 以及防火涂料厚度相对较薄时加固梁的破坏形态、高温变形和耐火极限。试验结果表明: 1) 加固梁在达到耐火极限之前相当长一段时间内的挠度及裂缝宽度和深度较小, 跨中裂缝对受拉钢筋温度影响有限; 2) 梁底混凝土的爆裂脱落可使加固梁的高温破坏位置发生显著改变; 3) 在实际荷载比不大于0.5的情况下, 即使防火涂料厚度较薄(10mm~20mm), 加固梁仍可达到2h一级耐火要求。

关键词: 碳纤维布 混凝土梁 火灾行为 试验 裂缝

Abstract: Test results of five concrete beams in fire are presented in this paper, four of which were strengthened with carbon fiber sheet and protected by passive fire insulation, and the other un-strengthened one was tested as a comparison. The primary objectives of these tests are to investigate the influence of flexural cracks at mid span on the temperatures of tensile reinforcements, and to evaluate the failure mode, deformation and fire resistance of the strengthened beams with relatively thin fire insulation. Test results show that: (a) the deflection and crack width and depth of the beam increase very slowly for a long duration of the fire, as a result, the effect of flexural cracks at mid span on the temperatures of tensile rebars is very limited; (b) spalling and debonding of concrete at beam soffit may cause a change of the failure location of the strengthened beam in fire; and (c) in the case that the actual load ratio is not larger than 0.5, the fire endurance of a strengthened beam with relatively thin fire insulation (e.g., 10 mm-20 mm) can meet the requirement of 2h in design code.

Key words: carbon fiber sheet concrete beam fire behavior test crack

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