

EXPERIMENTAL STUDY ON THE FLEXURAL CAPACITY OF REINFORCED CONCRETE BEAMS RETROFITTED WITH STRUCTURAL REPAIR MORTARS

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ABSTRACT

Bridges connect regions and facilitate public mobility. However, their frequent exposure to extreme environmental conditions—such as coastal areas with high chloride levels—leads to damage in reinforced concrete, specifically spalling. Mortar is a repair material that is easy to apply. This study aims to determine material quality, analyze control and retrofitted beams (using reinforcement replacement), and assess beam cracking patterns. Laboratory test results were compared with theoretical predictions. The study utilized beams measuring 150 x 200 x 1400 mm, featuring 2 D10 mm tension bars and 2 Ø6 mm compression bars, with a retrofit involving the replacement of tension reinforcement with 2 D10 mm bars. Two samples were tested for each variation. The results obtained were as follows: the 56-day compressive strength was 26.25 MPa for concrete cylinders and 32.47 MPa for concrete cubes (meeting the specified grade requirements, though the design target was not reached); the 28-day compressive strength was 40.09 MPa for mortar cylinders and 45.89 MPa for mortar cubes (failing to meet the mortar data sheet specifications). The flexural moment and load capacities obtained were: BK1 (cracking moment 5,15 kN-mm, ultimate moment 8,84 kN-mm), BK2 (cracking moment 3,22 kN-mm, ultimate moment 10,13 kN-mm), RM1 (cracking moment 3,22 kN-mm, ultimate moment 9,59 kN-mm), and RM2 (cracking moment 6,91 kN-mm, ultimate moment 8,84 kN-mm). The average loading percentage was 2.93%, with the control beams showing higher results than the mortar-retrofitted beams; the difference between the theoretical load for BK (39,59 kN) and the experimental average load (42.15 kN) was 2,57 kN. Crack patterns associated with flexural failure were observed at maximum loads of BK1 = 39.3 kN, BK2 = 45 kN, RM1 = 42.6 kN, and RM2 = 39.3 kN.

Kata kunci : Reinforced concrete beam, Retrofit, Structural repair mortar, Flexural capacity, Crack pattern.