

The Effect of Mapefill GP Mortar Application on the Flexural Capacity of Retrofitted Reinforced Concrete Beams

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ABSTRACT

Damage to reinforced concrete beams caused by cracking and spalling can reduce structural capacity and serviceability, requiring effective repair and retrofit methods to extend structural service life. This study aims to analyze the effect of Mefil GP Repair Mortar on the flexural capacity of damaged reinforced concrete beams after retrofit. An experimental method was employed by comparing control reinforced concrete beams with beams retrofitted using U-shaped Mefil GP Repair Mortar. The tests included concrete compressive strength, mortar compressive strength, flexural capacity, initial cracking load, cracking moment, ultimate load, deflection, and crack pattern observation. The normal concrete was designed with a target compressive strength of 25 MPa. The test results showed that the average compressive strength of the concrete reached 32.80 MPa, while the average compressive strength of Mefil GP mortar was 45.89 MPa. The flexural test results indicated that the use of Mefil GP Repair Mortar improved the beam's resistance to initial cracking. The average initial cracking load increased from 20.85 kN for the control beams to 23.53 kN for the retrofitted beams, representing an increase of 12.85%. The average cracking moment increased from 12.51 kN·m to 14.12 kN·m, representing an increase of 12.87%. However, the U-shaped retrofit did not increase the ultimate flexural capacity. The average ultimate load decreased from 42.15 kN for the control beams to 38.49 kN for the retrofitted beams, representing a decrease of 8.68%. The crack patterns were predominantly flexural cracks developing from the tensile region toward the compression region, with some developing into flexural-shear cracks. Therefore, Mefil GP Repair Mortar was effective in improving initial cracking resistance but did not restore the ultimate flexural capacity beyond that of the control beams

Keywords: Reinforced concrete beam, retrofit, flexural capacity, concrete compressive strength, Mefil GP repair mortar, concrete spalling, concrete delaminate.