

An Experimental Investigation of Rehabilitation and Strengthening of Reinforced Concrete T-Beams Under Static Monotonic Increasing Loading

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Abstract : An experimental investigation to study the behaviour of under flexure reinforced concrete T-Beams. Those Beams were loaded to pre-designated stress levels as percentage of calculated collapse loads. Repairing these beams by either reinforced concrete jacket, or by externally bolted steel plates were utilized. Twelve full scale beams were tested in this experimental program scheme. Eight out of the twelve beams were loaded under different loading levels. Tests were performed for the beams before and after repair with Reinforced Concrete Jacket (RCJ). The applied Load levels were 60%, 77% and 100% of the calculated collapse loads. The remaining four beams were tested before and after repair with Bolted Steel Plate (BSP). Furthermore, out previously mentioned four beams two beams were loaded to the calculated failure load 100% and the remaining two beams were not subjected to any load. The eight beams recorded for the RCJ test were repaired using reinforced concrete jacket. The four beams recorded for the BSP test were all repaired using steel plate at the bottom. All the strengthened beams were gradually loaded until failure occurs. However, in each loading case, the beams behaviour, before and after strengthening, were studied through close inspection of the cracking propagation, and by carrying out an extensive measurement of deformations and strength. The stress-strain curve for reinforcing steel and the failure strains measured in the tests were utilized in the calculation of failure load for the beams before and after strengthening. As a result, the calculated failure loads were close to the actual failure tests in case of beams before repair, ranging from 85% to 90% and also in case of beams repaired by reinforced concrete jacket ranging from 70% to 85%. The results were in case of beams repaired by bolted steel plates ranging from (50% to 85%). It was observed that both jacketing and bolted steel plate methods could effectively restore the full flexure capacity of the damaged beams. However, the reinforced jacket has increased the failure load by about 67%, whereas the bolted steel plates recovered the failure load.

Keywords : rehabilitation, strengthening, reinforced concrete, beams deflection, bending stresses

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