

Repaired reinforced concrete beams

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Abstract: Concrete structures often exhibit structural and nonstructural cracking due to a variety of reasons including impact and cyclic loading, static overloads, drying shrinkage, creep under sustained load, and thermal stresses and corrosion of reinforcement. Major cracks are signs of distress and require immediate attention. Minor cracks are often tolerable from the point of view of strength, but in areas of harsh environment such cracks may lead to accelerated rates of concrete deterioration and corrosion of reinforcement. However, repair of such minor cracks becomes necessary. A comparison between repair methods for reinforced concrete beams subjected to different levels of cracking was made experimentally. Four methods of repair were studied: epoxy injection; ferrocement; steel-plate bonding; and combined method of epoxy injection and ferrocement. Levels of damage studied ranged from beam cracking at service load to complete failure of the beams. Experimental data on strength and ductility characteristics of repaired beams were obtained, and comparisons were made. Epoxy injection is shown to restore strength and ductility for all levels of damage studied while ferrocement increases the strength and partially restores ductility, depending on the level of damage. The steel-plate bonding repair technique leads to an increase in strength, but concomitantly with considerable reduction in ductility of the repaired beams, regardless of the level of damage. The combined method of repair leads to both increase in strength and ductility. The increase in ductility will depend on the level of damage.