

Université Larbi Ben M'hidi - Oum El Bouaghi
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Département génie civil

Niveau : 1^{ère} Année Master LMD « option structure »

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Flexural performance of concrete beams reinforced with aluminum alloy bars

One of the main factors that lead to the deterioration of reinforced concrete structures is the corrosion of reinforcing steel. The aluminum alloy (AA) bars, which have favorable characteristics such as good ductility, low specific weight, good corrosion resistance, and recyclability, can be used as an alternative to steel reinforcement to increase service life of concrete structures. This study investigates the feasibility and performance of AA reinforced concrete beams. A total of nine specimens reinforced with AA bars and two specimens reinforced with plain steel bars, which serve as benchmark, were fabricated and tested under four-point bending up to failure. The longitudinal reinforcement ratio and the concrete strength were the main test variables for the specimens. The load-deflection curves, failure modes, crack patterns, crack width, and reinforcement strains were evaluated and discussed for each specimen. A modified section analysis and a strut-and-tie model were used to predict the load carrying capacities of AA reinforced beams for flexural and shear failure modes. The results indicate that the AA bars, if properly treated, can be utilized as reinforcement in concrete beam with satisfactory performance.

Keywords: Aluminum alloys, Concrete structures, Reinforcement, Flexural response, Beams.